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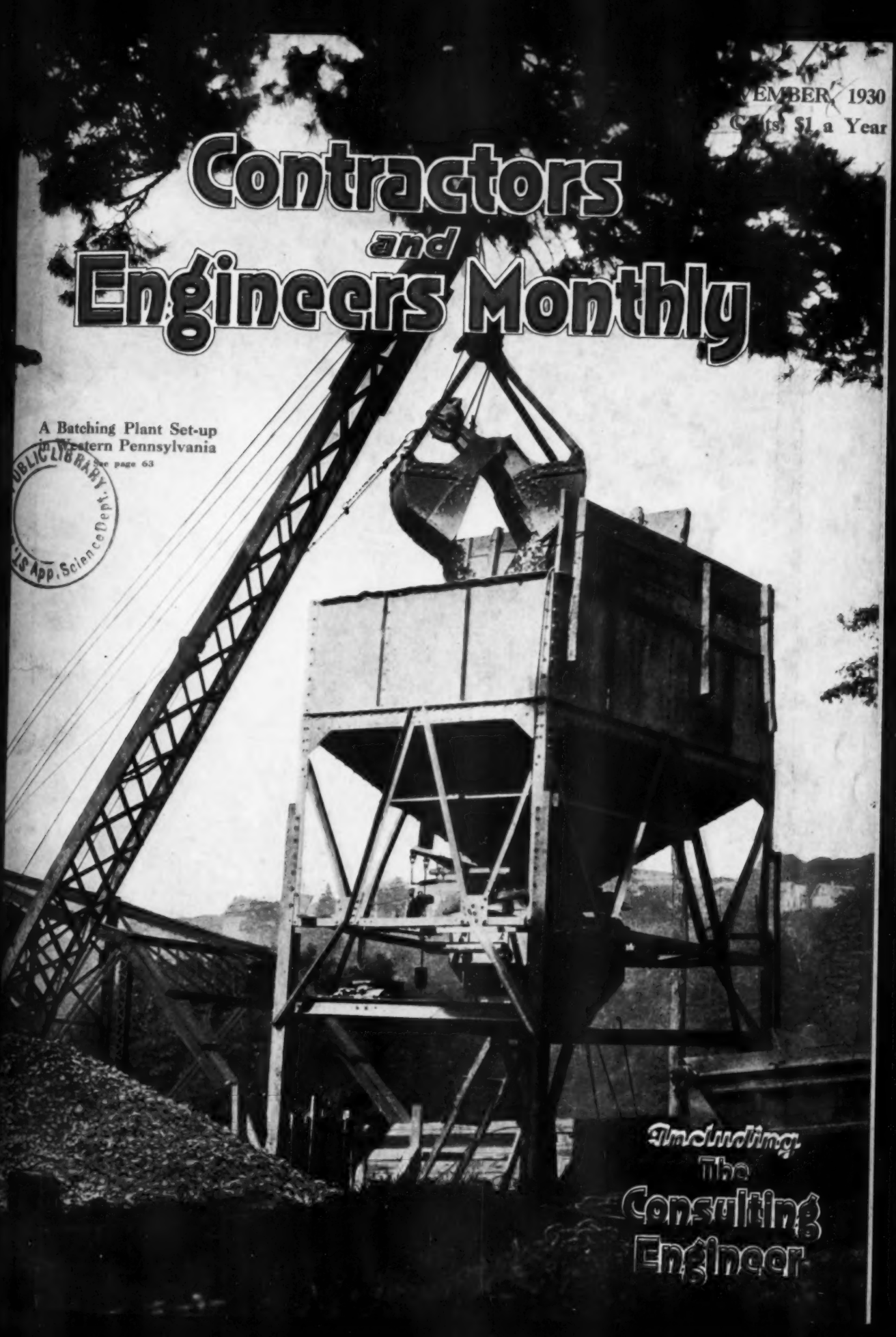

A Batching Plant Set-up in Western Pennsylvania

See page 63

Including The Consulting Engineer

Vol. XXI No. 5 CONTRACTORS AND ENGINEERS MONTHLY. NOVEMBER. 1930 Price, 25 Cents; $1 a Year
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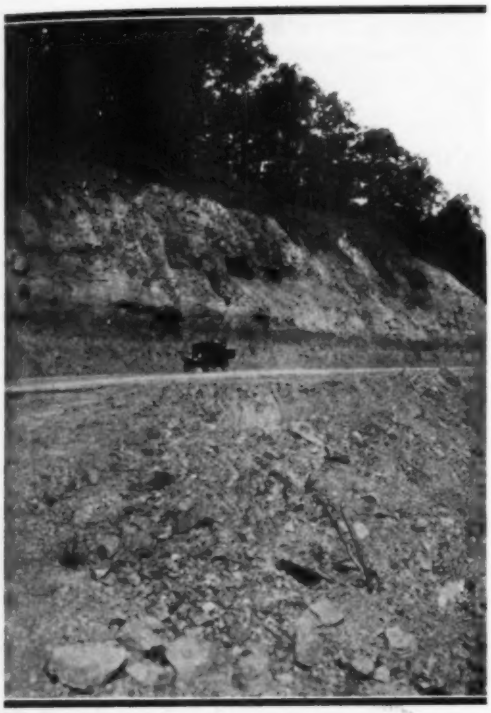
Fill—

Now You Have It

and

Now You Don't

Hatfield Construction Company's Work in Widening Old 16-Foot Brick Highway Resulted in Game of Hide and Seek



The Scene of a Big Landslide in West Virginia Near Huntington

A TOTAL of 205,000 cubic yards of excavation with 2,205,000 station-yards overhaul was one of the features of the 7.39-mile job of the Hatfield Construction Co., Huntington, West Virginia, on U. S. Route 60 just east of Huntington in widening the old narrow right of way of the 16-foot brick road to 20 feet with a 10-foot shoulder on either side to give a 40-foot roadway. The big party, however, was to find the fill the morning after it had been made. In one place a fill of 20,000 yards went out over night and partly blocked the channel of Mud River. That was not so bad but a little farther along the road where another slide occurred it was necessary to cut back into the hill to get on solid ground and waste 20,000 yards of perfectly good earth.

Excavation Mostly Rock and Shale

About 80 per cent of the total excavation was in shale that had to be drilled and shot, while 5 per cent was rock or sandstone that had to be similarly treated. The remaining excavation which was all bid as "unclassified" at 53 cents a cubic yard was just earth, and that all in one cut.

The contractor had two drilling outfits on the job, consisting of two Ingersoll-Rand portable air compressors with I-R jackhammers. One compressor was 9 x 8 and the other, 5½ x 5. The average depth of holes was 16 feet while the maximum for many ran up to 20 feet. Some rock cuts ran deeper than 20 feet but the longest drill steel on the job was 20 feet so that these cuts had to be handled in two lifts. One blacksmith on the job handled all the drill steel sharpening.

Somewhat over 1,000 pounds of du Pont black powder and about 35 tons of 40 and 60 per cent du Pont dynamite were used in the shooting.

Old Railroad Grade Widened

A considerable portion of the new work consisted in widening the old railroad grade of the Chesapeake & Ohio Railroad which was sold when the railroad made a new location and was used for the brick highway which is now being widened. The railroad did not care for the steep and narrow cuts for the single track line so they were left that way. The traffic that used the brick highway built over the same grade did not object, but the high speed, heavy traffic of busses and trucks that use the modern roads would soon rattle down the loose rocks and cause serious damage. Thus it was necessary to widen all the cuts and in two cases to raise the grade in the cuts to get sufficient drainage to prevent a repetititon of the troubles of past winters when the road was wet at all times and a sheet of ice during low temperatures.

The brick pavement was in remarkably good condition, considering the nature of the subgrade which had

slipped slightly in a number of places. In those places where the subgrade had remained stable on the old railroad fill the brick were in perfect condition. In the cuts, where considerable blasting was necessary to widen the right of way, brick and some rock were thrown out of the roadbed by the tremors which carried for considerable distances in the shale and sandstone.

DRAINAGE STRUCTURES

As the work was widening there were a number of culverts, both pipe and box, that had to be extended. The contractor used 12, 15, 18 and 24-inch reinforced concrete culvert pipe for the extensions. There were several box culverts from 2 x 3 to twin 4 x 4-foot concrete culverts included in the extensions.

At one point about 3 miles from the Barboursville end a slide of the side hill fill broke a culvert and completely shut off a county road. It was necessary to jack a 48-inch corrugated iron culvert with paved invert through 220 feet of fill to correct the damage caused by this slide. The usual methods for jacking culvert pipe were used for this work. The only unusual feature was the length of the pipe jacked through. In this case the slide broke even with the old brick pavement.

In the cuts where the grade was raised to give better drainage the contractor placed 8-inch corrugated iron perforated pipe along both ditches and filled with broken stone. The stone from one of the largest cuts was hauled back to the bad slide at the end of the first mile out of Barboursville and used as rip-rap at the toe to prevent the river from cutting under the fill and causing more slides. The method of getting the fill to hold will be described later on in this article.

WORK PROGRESSED RAPIDLY IN SPITE OF SLIDES

The work on this contract which was awarded for $155,231.20, was started on July 15, 1929, and was completed within twelve months. The contract called for widening of the grade only as the paving will be done under another contract when the action of the fills is known, probably not before another year. It is expected that there will be a concrete slab over the old brick road and thickened where it widens the pavement.

Work was shut down from December 15, 1929, to March 15, 1930, by order of the state as work at that time might have caused a complete tie-up of traffic from an unsettled subgrade. The contractor was fortunate in not having rain for over two months from the middle of April to the middle of June. This helped the fill to stabilize without danger of slipping from the lubricating effect of the extra moisture. As it was there was plenty of slipping.

One 14,000-yard cut in rock was drilled, shot, moved

TRYING TO CATCH UP WITH WEST VIRGINIA LANDSLIDES

1. Just a dip in the road where the land slipped into the Mud River, making a drop of about 3 feet in the grade. 2. About 20,000 yards went out here one night and the road had to be cut back into a high ledge to get a solid foundation. 3. A Lorain shovel loading one of the fleet of trucks hauling to 4, where a slide had occurred in spite of a line of well casings driven to hold the earth. Note the well rig below at the right driving a new line of casings to check further slipping

by a single Lorain 75, and hauled out in just 16 working days, a mighty fine record for work in a cut.

The maximum cut on the job was 50 feet deep and the maximum fill about the same but was on a side hill and not a true new fill. The only complete fill on the project was for the country road that was cut off by one of the slides. A new location was made and connected with the main highway by a long fill.

Excavating and Hauling Equipment

One Lima 101 shovel and two Lorain 75 gas shovels were used on the work which was started at the center of the project. The hauling of the 2,205,000 station-yards of overhaul as well as the short hauls was done by subcontract by W. L. Pinson of Barboursville, W.Va., who used 9 Schacht trucks with steel bodies. The contractor used a maximum of 60 men on the job including the shovel and tractor and grader operators. The fills were made by end dumping of the trucks and then trimmed by hand, by a Caterpillar Thirty and Sixty each equipped with bulldozers and finally with a Galion grader with an 8-foot blade hauled by a Cletrac tractor. Thus there was a minimum of labor and equipment for handling this large job, but it went forward with dispatch.

Handling the Slides

Close to the Barboursville end of the job there was a bad slide referred to before. Traffic, which was maintained over the road during the entire time of the contract, was held up at this point by a flagman to insure its running slowly over a bad slip. Evidently there had been previous trouble at this point, for when the hand labor began to pick out the pavement where it had slumped badly there were several layers of paving below.

At this point, in an endeavor to check the slide, the state forces had put in a row of 8-inch well casings filled with concrete about 40 feet from the center line of the road but they were bent over at various angles by the motion of the earth. A new line was driven during the filling about 30 feet farther from the center line using a Sanderson-Cyclone well hole drill. These holes hit shale at depths varying from 19 to 25 feet and were drilled from 17 to 20 feet into the rock. The deepest hole went to a total depth of 57 feet. These holes were shot in groups of three using 6 boxes of 40 per cent du Pont dynamite per hole in an attempt to roughen the underlying rock sufficiently to hold the fill and thus stabilize the subgrade. The holes were spaced about 15 feet apart over most of the line and 20 feet apart toward the end.

During this drilling there was further evidence that this section had cut up before as there was an old wood piling cut-off along the river bank and the drills hit a 10-foot concrete wall that must have been put in when the railroad was put through and slid out although the local "oldest inhabitant" could not remember its origin. Incidentally, it might be of interest to those who indulge seriously in fishing to know that when the first blast was shot at this slide a 24-inch bass was killed and floated to the surface. This is practical information for the fishermen among our readers.

A distance of about 3,000 feet in the first mile from Barboursville had to be relocated with a drop in grade as the railroad could not economically change its line to permit a widening on that side. In order to get sufficient material for widening, the grade was lowered and overhaul avoided.

In the second mile from the same end there was a slide of about 20,000 yards of earth fill, while in the third mile the slide that shut off the country road made necessary the cutting back of a hill about 29 feet to get the grade onto solid ground. This is where the 20,000 yards of excavation was wasted.

Personnel

This contract was completed by the Hatfield Construction Co., Huntington, W. Va., with K. D. Sarrett as Superintendent. The work was done for the State Road Commission of West Virginia under the direction of H. J. Spelman, Chief Engineer, B. G. Etchison, Engineer of Construction, S. E. Bradley, Senior Assistant Engineer, L. P. Street, Assistant Engineer and C. E. Allen, Assistant Engineer, with J. M. Stewart as Inspector.

Welding the Steel Deck Floor in the Wendell Garage

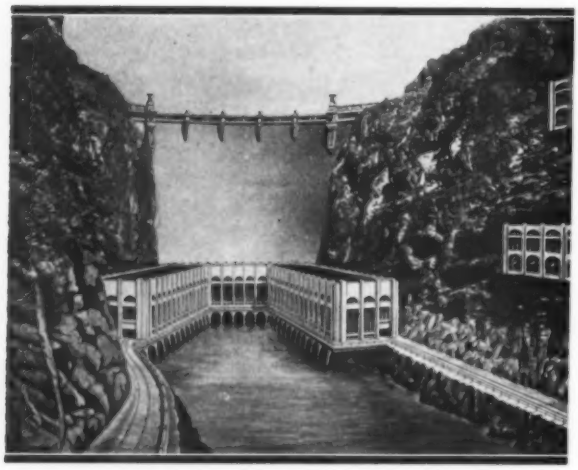
Welded Steel Floors a New Type of Construction

WORK has recently been completed on the Wendell Garage at Pittsfield, Mass., which contains one of the largest areas of battledeck floors so far constructed. This particular system was first advocated by the American Institute of Steel Construction. Lighter, stronger, safer and more efficient and economical buildings are assured by this floor. The building was erected for the Berkshire Auto Co. of Pittsfield from plans by George E. Haynes, architect. The structural steel was fabricated, erected and welded by the Haarmann Steel Co. of Holyoke, Mass., and the General Electric Co. welding equipment was used throughout.

The illustration shows the automatic machine welding the steel plates to the beams. There are approximately 8,500 square feet in this floor and there will be no covering on the steel plates. The floor consists of steel plates ¼-inch thick and 24 inches wide, welded to 5-inch I-beams. The average span is 20 feet. The safe maximum distributed loads is 135 pounds per square foot, the floor itself weighing 15.2 pounds per square foot. As the garage will have an approved automatic sprinkler system throughout, no protection is required underneath the floor construction.

In the December issue of CONTRACTORS AND ENGINEERS MONTHLY will appear an article by Dr. *Alanson D. Morehouse on the problems encountered in taking the Construction Census during the last few months. Contractors are urged to file their reports promptly and read the directions carefully.*

A Complete Outline *of the* Boulder Canyon Project *on the* Colorado River



Artist's Conception of the Completed Structure

By

W. A. Scott

PRELIMINARY work was begun in July, 1930, on the Government's Colorado River Development, officially and generally known as the Boulder Canyon Project. The Act of Congress, approved by the President December 21, 1928, authorized the expenditure of $165,000,000 on the construction of the three principal phases of the project, to be carried through under the direction of the Secretary of the Interior. The authorization of this sum was based on estimates made by the Colorado River Board in three divisions as follows:

Dam and reservoir	$70,600,000
Power plant of 1,000,000 horsepower	38,200,000
All-American canal	38,500,000
Interest during construction	17,700,000
	$165,000,000

The Congressional Act referred to does not carry any appropriation, but it makes the progress of construction dependent upon subsequent appropriations. In conformity with this, an appropriation of $10,660,000 was made during the last session of Congress which enabled the Department to proceed with the preliminary phases and first stages of the dam construction during the fall of 1930.

Location of Dam Site

The outstanding feature of the project is the construction of a concrete arch dam across the Colorado River, in Black Canyon, where the stream forms the boundary line between Arizona and Nevada. This site is about 20 miles downstream from the one first tentatively chosen in Boulder Canyon. The Black Canyon site is 30 miles southeast of Las Vegas, Nev., the latter being on the Union Pacific Railroad.

Preliminary Work

Preliminary work, preparatory to actual construction at the dam site, requires an expenditure of close to $5,000,000. The first essential is the building of a 30-mile line of railroad from a point on the Union Pacific, 7 miles south of Las Vegas, to the rim of the canyon wall at the dam site. Besides this, the plans provide for the construction of an inclined track from the canyon rim down to the river level below the power house site. The first 22 miles of the railroad is being built by the Union Pacific Co., and the 7-mile section at the dam by the United States.

Next in importance is the construction of a modern village for housing purposes near the dam site, provided with water supply, sewers and electric lights, all to be done by contract. Electric power required for construction work and lighting, according to previous announcement, is to be derived from the existing power system of the Southern Sierra Power Co. Then, plans provide for the construction of a 7-mile automobile road from the village to a point above the dam.

As soon as transportation, housing and power have been provided, as outlined above, the activities at the dam site will be commenced. The first work to be undertaken will be the driving of four tunnels for river diversion. The plans provide for two 50-foot diameter

tunnels on each side of the stream, each of a length of 4,000 feet. The four are designed for the maximum diversion capacity of 200,000 cubic feet per second, and are to be utilized as power and spillway conduits after the completion of the dam.

The completion of the tunnels and the diversion of the river will be followed by the construction of the upstream and downstream cofferdams, which will be 1,850 feet apart. Then, as soon as the dam site has been unwatered and the canyon walls stripped of loose rock, the work of excavating from the river bed down to solid foundation rock will be accomplished, preparatory to the pouring of mass concrete.

Dimensions of Dam

While the great dam is to be built across the Colorado in Black Canyon, it is still referred to as part of the Boulder Canyon Project and has been officially named Hoover Dam. The structure is designed for a height of over 700 feet above the base, the latter being at a level of about 125 feet below low water. It will have a length of 1,167 feet at the crest. The work involves the placing of about 3,500,000 cubic yards of concrete, requiring about two years and eight months for its completion.

Outlets at Dam

The only outlets through the dam will be at river level, for passing the stream at low water stage while the tunnels are being plugged. The outflow of water for irrigation supplies will be through tunnels in both canyon walls, connected with the reservoir and controlled by needle valves.

Types of Spillways

Plans for flood-water regulation require types and capacity of spillways that will prevent an overflow of the dam crest. The glory-hole type of spillway is shown in the tentative plans. This contemplated spillway intakes through two vertical shafts, each 50 feet in diameter, leading down to connections with the outside diversion tunnels.

Storage Basin Above Dam

The construction of Hoover Dam in Black Canyon will create a storage reservoir of the capacity of about 30,000,000 acre-feet, having an extent of more than 100 miles upstream from the dam. The principal volume of storage will be in the lower river section, where the valleys of the Virgin River and Las Vegas wash, on the Nevada side, and the Detrital Valley, on the Arizona side, all open into the main canyon of the Colorado. The storage area of the upper section is confined to the comparatively narrow canyon.

Formation at Dam Site

The rock formation at the Black Canyon dam site consists of volcanic flows and tuff-breccias of andecitic composition. This character of formation is considered durable and impervious, making it suitable for the dam foundation and abutments. The material is considered most favorable for tunnel driving.

Power Plant

The project plans provide for building and equipping a hydro-electric plant of the capacity of 1,000,000 horsepower at a site immediately below the dam. It is proposed to build a U-shaped power house, with one wing on the Arizona side and the other wing on the Nevada side, the base of the U connecting the two wings and resting upon the downstream toe of the dam. This is to be a 12-unit plant, with six generating units in each wing. The hydraulic turbines on each side will be driven from penstocks through which water will be delivered from the diversion tunnel on the same side.

Principal Purposes of Project

The three main things to be accomplished by the construction of Hoover Dam are: flood control by regulating the flow of the river on its lower course; the storage of water, for the irrigation of land, and for domestic and municipal supplies; the generation and sale of electrical energy at the dam as a means of returning to the Government the amount of its investment, and paying maintenance expenses.

Flood Control

The storage of water above the dam, so as to reduce the volume of discharge through the delta region at the river mouth, is of great concern to the 70,000 people of the Imperial Valley in southeastern California. This highly productive region, in which 450,000 acres are under irrigation, is below sea level and is lower than the bed of the Colorado River. The one barrier that prevents the submergence of this valley during periods of high water is a levee 70 miles long.

The discharge of the Colorado, through the delta region into the Gulf of California, in Mexico, has varied greatly for different flood periods. The greatest on record was in 1884, when, it is estimated, there was a flow of 30,000,000 acre-feet from April to July. This, at a maximum daily flow of 250,000 second-feet, was 60 per cent greater than at any flood period since 1884.

The capacity of the reservoir, to be established by building the Hoover Dam, is sufficient to hold back the entire volume of the river for 1½ years. Therefore, by controlling and equalizing the river flow at the dam, the possible flood disasters in Yuma and Imperial Valleys will be averted, and a balanced water supply may be maintained in the reservoir, to be drawn upon for irrigation, power and municipal purposes, with no likelihood of a shortage. Thus, the high-flow period of 200,000 second-feet and the low-flow period of about 1,200 second-feet will be equalized to maintain a standard full-year distribution.

Black Canyon Dam Site on the Colorado River Where the Hoover Dam Is to Be Built

CONTRACTS FOR SALE OF POWER

As a condition precedent to the execution of work on this project, the Congressional Act requires the Secretary of the Interior to contract with public utilities, states, municipalities and districts for the sale of the power output at the dam, covering a period of 50 years. The price per kilowatt-hour is such as will pay expenses and fixed charges, and return to the Government its original investment. It is understood that contracts to purchase have been entered into with the Commonwealth Edison Co., Los Angeles, and the Metropolitan Water District, comprising Los Angeles and several other Southern California municipalities. This district is a strong contender for power sufficient to pump water through five lifts on the first 49 miles of a 300-mile aqueduct to be built from the Colorado River to the vicinity of Los Angeles. These applicants and others, apparently, stand ready to use all power produced as soon as it is ready for delivery.

THE ALL-AMERICAN CANAL

An important feature of the Boulder Canyon project will be the construction of the All-American canal, 75 to 80 miles long, to provide a supply of irrigating water for the Imperial Valley, in California, which shall be exclusively within United States territory. The Imperial Canal, which is now the source of supply for that valley, starts at a river-diversion point on the American side, crosses the boundary line, makes a loop of 60 miles on the Mexican side, then bears northerly into the Imperial Valley in California. Now, the producers of this valley, who have 450,000 acres under irrigation, for years have been anxious to escape from the trying complications that arise in connection with the operation of an international canal. Under the provisions of the Boulder Canyon Act, the Government is to build the All-American Canal, at an estimated cost of $38,500,000, but this sum is to be repaid by the irrigators of the Imperial Valley.

This proposed canal, to have the carrying capacity of 15,000 second-feet, is to begin at the Colorado River, possibly at Laguna Dam, 15 miles above Yuma, and extend southwesterly, then westerly, to a point 10 miles north of Calexico, in the Imperial Valley. Plans contemplate establishing several electric power plants along the line of the canal.

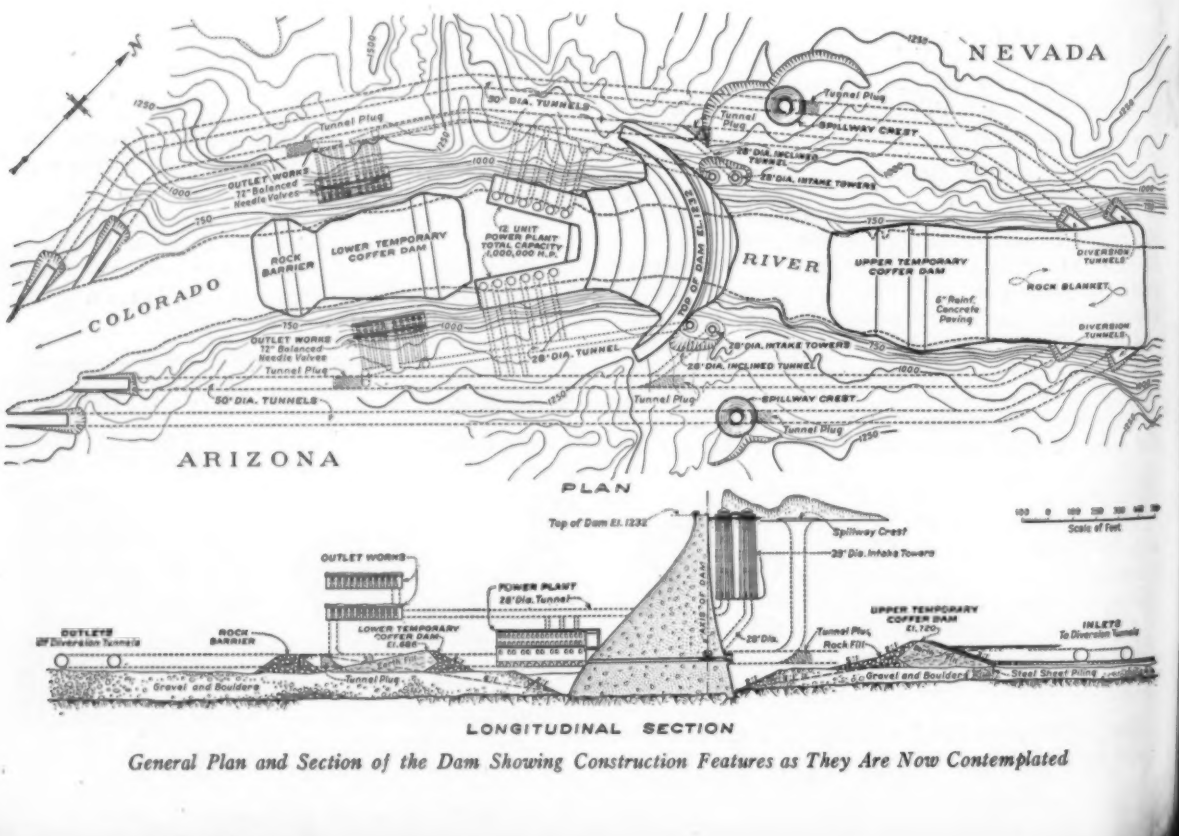
The canal route, if the original plans are finally adopted, requires the crossing of a sandhill area, lying west of Yuma, which is about 10 miles wide. The excavation of the canal through these dunes of drifting sand will require cuts of the maximum depth of 100 to 120 feet, involving a most difficult piece of work. Construction of this canal will proceed simultaneously with that of the dam, and will require six years' work.

The high capacity of the All-American main canal will be sufficient to afford a supply of water for the proposed Coachella branch canal, 140 miles long. This branch, according to plans, is to divert water from the main canal 40 miles west of Laguna and extend northwesterly to a point in Coachella Valley near Indio, Calif. The construction of the Coachella branch, at an estimated cost of about $11,000,000, may require a special appropriation by Congress.

DEVELOPMENT OF PLANS

The development of the project plans was preceded by exhaustive explorations, geological and engineering studies of dam sites in Boulder and Black Canyons,

(*Continued on page 71*)



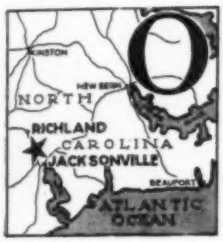
General Plan and Section of the Dam Showing Construction Features as They Are Now Contemplated

100 Working Days

or

Jumping the Gumbo

Poor Subgrade
Unstable When Wet
Reduced
Usual Speed of Operation
of
West Construction Company
But—
Job Was Finished Ahead of
Contract Date



ORGANIZATION and equipment have placed the West Construction Co. of North Carolina in the vanguard of paving contractors working on sand asphalt construction in the south. On the 13.27-mile Federal Aid job from Jacksonville, N. C., to Richland, N. C., the Simplicity asphalt plant set up at the center of the work produced as much as 600 tons of road material a day with an average of well over 400 tons a day. Production was greatly reduced by the poor subgrade which contained a great deal of gumbo which held water after the rains and when in that condition presented an impossible material to haul over. In some sections as much as a half-mile in length, it was necessary to completely remove the subgrade which had been put down under an earlier contract and replace it with a satisfactory material containing more sand.

Progress

The contract was let to the West Construction Co. of North Carolina, on December 17, 1929; fine grading and form work started on March 12 and 20 respectively; and the first asphalt went onto the road on March 26. With 100 working days for the job the contractor was able to complete the paving well ahead of the specified limit in spite of the subgrade troubles. This was only because of the fine organization which was maintained and the plant set-up which made maximum production a matter not of a few days during the contract.

Fine Grade and Form-Setting Organization

To move the earth from the center of the road to the shoulders the contractor rented a tractor and a blade grader, and in addition used about 6 wheel scrapers where needed to remove the poor material from the existing subgrade and pulling in the top soil to replace it.

The grading gang consisted of a foreman with 1 roller man for the 3-wheel Buffalo-Springfield gas roller and from 8 to 10 laborers. Two teams with drag pans normally accompanied the grading gang.

On form setting there was 1 foreman with 15 men who handled all the work of digging the trenches for the 2 x 8-inch x 10 to 16-foot planks and the driving of the stakes formed by ripping 2-foot length of 2 x 4's diagonally. These were driven 2 feet on centers except on the curves where the stakes were placed every foot on the low side. The road was superelevated on the curves and on the tangents had a crown of 1½ inches.

Organization and Production at the Plant

The West Construction Co. of North Carolina used a Simplicity System asphalt plant complete with a well-planned set-up for the handling of all of the materials, both raw and completed hot mix. The big portable plant was set up near the center of the project about 100 feet off the road where a spur track was available from a logging railroad which gave access for the tank cars of Texaco 50-60 penetration asphalt shipped from Norfolk, Va., and the limestone dust which came in box cars from the Liberty Lime & Stone Co., Rocky Point, Va.

Facing the plant the observer saw the spur track running in front of the plant with the dust house and platform for unloading for storage. In the center was

the mixer and the drive into which the trucks backed for the batches. At the left were the tank cars being heated from the boiler of the main plant and the asphalt being pumped by a Kinney asphalt pump into the large storage tank capable of holding 6 tank car loads of asphalt. The storage tank was heated in the same manner by coils within the shell.

In back of the plant a double ramp had been built so that the trucks hauling sand could come up one side and dump over a trap directly above the sand feeder for the plant and then the trucks drove down the opposite side preventing any traffic troubles. A fleet of five trucks was kept busy hauling the sand from a pit about 1 mile down the road after the pit at the plant ran out. A Keystone excavator was used for stripping the sand and loading the trucks. Excess sand which ran away from the barricade which held the sand from overloading the cold sand elevator was picked up by a Bucyrus-Erie crane with a 1¼-yard Owen bucket and piled into the trap as needed. The crane also loaded trucks from the large stockpile that was maintained adjacent to the plant in case the pit became unsatisfactory.

The operating crew for the plant consisted of a foreman with 1 crane man, 1 oiler for the crane, 1 engineer for the plant, 1 oiler, 1 day and 1 night fireman, 1 weigh-box man, 1 mixer man, 1 temperature man who controlled the temperature of the sand in the hot elevator by the speed with which he admitted the sand to the drier, 1 checker who gave the tickets to the hauling trucks, 1 coal man, 2 men on wheeling the limestone dust, 1 man at the sand trap pulling out roots and other material that should not reach the drier and batches, 1 handy man around the yard cleaning up, and 1 helper at the crane.

Hauling the Hot Mix

The hauling of the batches as well as the sand for the plant was done by subcontract by the A. G. Boone Co., of Columbia, S. C. The hot batch which contained for the base course, 160 pounds of asphalt, and 1,840 pounds of sand, and for the top, 210 pounds of asphalt, 180 pounds of dust and 1,610 pounds of sand, was dumped into the metal bodies of the United trucks which stood by until four batches were mixed one minute each and dumped. Upon arriving at the plant for the batches the metal bodies which were equipped with Wood hoists were oiled with a Standard Oil Co. of N. J. product similar to the oil used for flushing crank cases. All of the trucks were equipped with balloon tires which was a great help in hauling through the sandy subgrade and which saved a great deal of wear and tear on the trucks.

Paving, or Placing the Hot Stuff

Paving was started at the Jacksonville end of the job and continued to the plant leaving several sections until the subgrade dried out or was improved with new material. Work was then transferred to the Richlands end and continued to the plant with the same difficulty with poor subgrade in certain sections.

The trucks were turned on a Blaw-Knox turntable because of the soft subgrade and then backed about 200 feet to the dump board, a sheet iron pan measuring

(*Continued on page 61*)

OPERATIONS ON AN EXTENSIVE SAND ASPHALT JOB

1. Wheel scrapers working on the shoulders, a typical scene in Southern road construction. 2. The set-up of the Simplicity asphalt plant showing the asphalt tank at the left. Aggregate was stocked on the far side of the plant by trucks running up a ramp. 3. A part of the fleet of United trucks owned by A. G. Boone Co., subcontractors for hauling the hot mix

Photo by Fairchild Aerial Surveys, Inc.

The Completed Washington Bridge Between Providence and East Providence, R. I.

Concrete Arch Bridge *Over the* Seekonk River Opened *for* Traffic

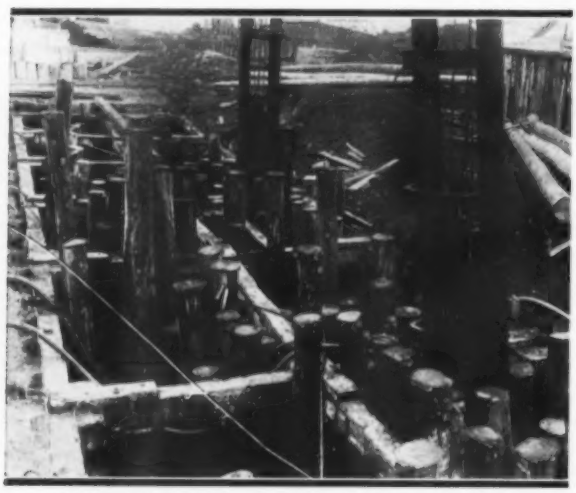
Merritt-Chapman & Scott Corp. Delivered 2,408-Foot Structure Complete in 26 Months

WASHINGTON Bridge, built by the Merritt-Chapman & Scott Corp., for the state of Rhode Island, under contract with the Washington Bridge Commission, was dedicated on September 25, 1930. The new structure, which spans the Seekonk River, to connect Providence and East Providence, R. I., becomes a vital part of the main path of travel for the busy traffic to eastern Rhode Island and southeastern Massachusetts.

This bridge is of the concrete arch type, with 12 arches and a 150-foot steel double bascule lift over the channel, clearing the water by 43 feet at mean tide. Each lift of the draw weighs 450 tons, is operated by two 40-horsepower motors and can be elevated to its full height in 1½ minutes. Auxiliary gasoline motors are provided for emergencies should the electrical supply fail. The bridge is 2,408 feet long, with the approaches, and is 80 feet wide, providing not only a 60-foot roadway carrying double trolley tracks, but in addition two 10-foot sidewalks. The old steel bridge which it replaces, built in the early eighties, was only about half as long and half as wide, although it also carried two trolley tracks. The old bridge had, of course, grown more and more inadequate with the increasing population and traffic density. It is significant that the new bridge required three times as much tonnage of reinforcing steel as there was structural steel in the old bridge. This was due to the type of structure and the longer spans.

The West Retaining Walls, Ready for the Setting of the Uncoursed Irregular Granite. Pier No. 1 Is Shown in the Foreground

The bridge is granite faced throughout with a singularly present texture. The cope and sidewalk railing appear to be granite as is the facing, but actually it is a specially mixed concrete, using crushed granite for aggregate. This railing and coping was poured in place and finished to reveal the aggregate in a manner to produce this effect. Many months of experimental work was done to achieve the desired results. Effective lighting is assured through the use of 40 ornamental standards surmounted by massive bronze lanterns. These, together with brass flagpole bases and the dedicatory placques, were cast by Gorham of Providence.



Driving 304 Piles, 40 Feet Long, with Two McKiernan-Terry 11-B-2 Hammers on Pier 3

Substructure

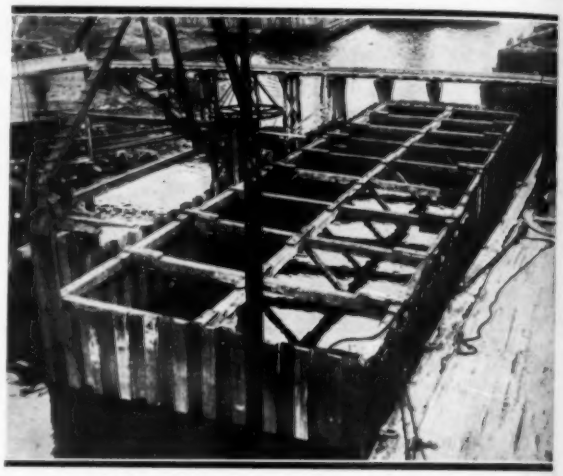
The substructure consists of 18 piers, each placed by the open cofferdam method. The end piers each are flanked by several hundred feet of reinforced concrete retaining wall to support the approach fills. The deepest of these piers, No. 6, goes down to 47 feet below low water. The bascule piers are 55 feet by 121 feet. The superstructure spans not only the Seekonk River, but two of the city streets and the tracks of the New York, New Haven & Hartford Railroad.

Contract Details

The contract for the Washington Bridge was awarded to Merritt-Chapman & Scott Corp., on July 14, 1928, for $2,984,000. The contract was approved on July 18, 1928, and called for completion in 27 months. Work on the structure was started within 7 days of the approval of the contract, so that the dedication took place approximately one month before the time specified for the completion of the work.

Pier Seals

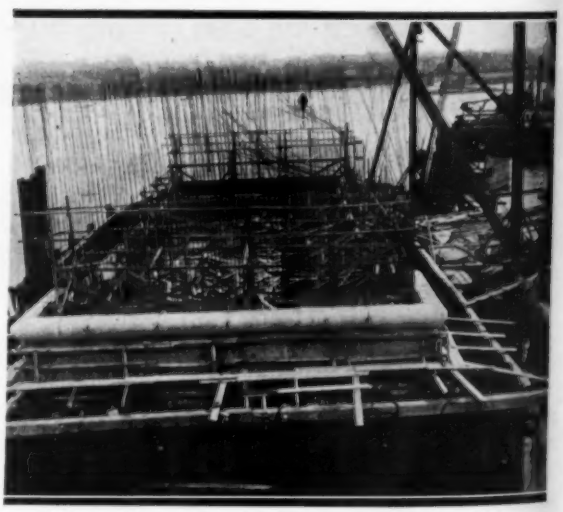
Piers Number 7 and 8, the main bascule piers, each required approximately 3,300 cubic yards of concrete in the seal. In each instance this concrete was placed in a continuous pour of 72 hours.



The Cofferdam for Pier No. 5 with the Key Pile Partly Down and the Derrick "Reliance" Alongside

Material Requirements

Some of the quantities of the materials required are given in the list below:

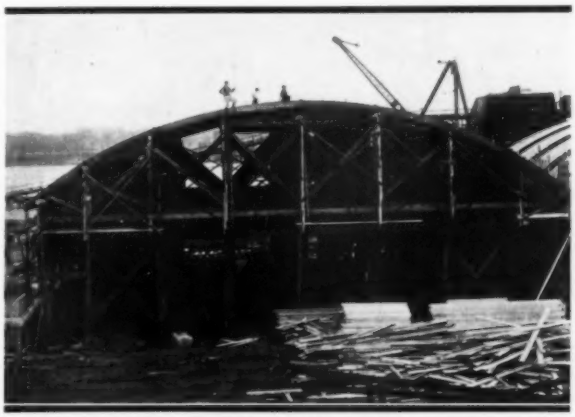


The Machinery Floor of Bascule Pier No. 8, Showing the Reinforcing for the Side Walls

Concrete, cubic yards	82,000
Reinforcing steel, pounds	3,660,000
Structural steel and machinery, pounds	3,000,000
Sheet steel piling for cofferdams, tons	1,000
Timber piles	7,000
Concrete piles	428
Uncoursed irregular granite masonry, cubic yards	783
Rock face granite masonry, cubic yards	1,305
Machine-pointed granite masonry, cubic yards	931
Four-cut granite masonry, cubic yards	765

TWO STATIONARY CONCRETE PLANTS AND ONE FLOATING PLANT

There were two stationary concrete plants established by the contractor and one floating plant was brought in. On the East Providence side, where ample room was available for storage, the land plant was placed, consisting of Blaw-Knox bins and hoppers, Smith mixers, and belt conveyors. A second plant was constructed on piles approximately 200 feet from the Providence shore. This plant, consisting of a Blaw-Knox bin and a Smith mixer, was so arranged that the mixer discharged directly over a standard gage trestle



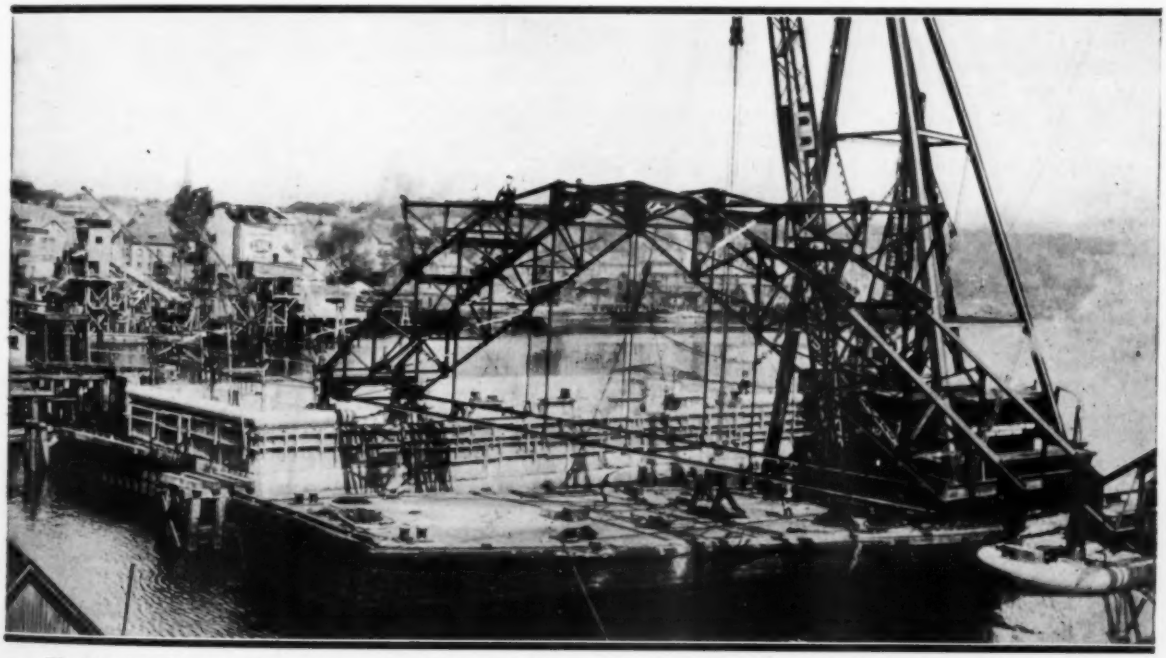
The Timber Centers for the 89-Foot Span from Pier 11 to Pier 12, Showing the Unloading Conveyor and Derrick Serving the Hopper of the Land Concrete Plant

go" of the Black Horse fleet, was provided to insure capacity for the heavy continuous pours on Piers 6,7 and 8.

Operation of the main concrete plant was facilitated by the use of a 400-foot Chain-Belt belt conveyor, which extended from the unloading dock to storage piles directly behind the concrete plant. The discharging end of the conveyor was elevated to a height of 45 feet, and was equipped with a tripping device, permitting discharge of sand and stone in separate piles on either side of a separating wall beneath the hopper loading derrick. This derrick was also elevated on piles so that it could easily load the 115-ton bin which supplied two 1-yard Smith steam-driven mixers.

TIMBER BENT AND STEEL TRUSS CENTERS

Both timber bent type and steel trusses were used for centers. Timber bent type centers were used for six 89-foot and two 105-



The Floating Derrick "Reliance" Placing the Steel Arch Center on Piers 8 and 9, Showing the Special Lifting Frame

parallel with a track which connected with the land track and which extended to the end of the bridge. Sand and stone for this plant were taken directly from the box barges which worked from the quarries. This consisted of a cement storage shed, a stiff-leg derrick with 60-foot boom, a 51-ton Blaw-Knox bin and two batchers, a Smith 28-S mixer, and a Ransome 36-cubic foot hoist bucket in a 75-foot standard Ransome steel tower. The third plant, constructed on the barge "Chica-

foot spans. The weight of each rib of the arch was supported by 2-inch tongue and groove lagging on six 4-inch x 14-inch joists. Joists, 20 inches on centers, with spans 12 feet long, were used at the crown of the arch. The maximum load on the piles was 13 tons, and the bearing on the oak wedges was 250 pounds per square inch. The centers were built as complete frames and handled as a unit after striking. A total of 470,000 board feet of lumber was used for three 89-foot and one

The Forms for the Bottom of the Arch Ribs and the Intrados and Extrados Steel Being Placed

105-foot spans, exclusive of the side forms for the arch rings.

Steel trusses were used as centers for four 105-foot arch spans. The weight of the concrete was carried by 3-inch tongue and groove lagging on four 6-inch x 14-inch joists. Two trusses 12 feet 1 inch on centers were used to support each rib spanning the 110 feet between centers of the sand jacks. Trussed purlins were used to support the timber joists. The centers were designed as 3-hinged arches with bottom angle ties.

The weight of two trusses with the steel purlin-sand bracing for one arch rib was 27.5 tons, while the total steel for two spans of six ribs each with the centers being used twice weighed 330 tons. A specially designed lifting frame was used for the erection of two completely assembled trusses as a unit to their position on the piers.

Details of Handling the Steel Arch Centers

The trusses were made up in two individual sections pin-connected at the crown. To take the thrust there was an angle tie from end to end. Normally, when the trusses are working this compression would have a reaction at each end under uniform loading across the top. This would give tension in the lower tie and compression at the crown pin. A complete unit, consisting of two trusses for the full span, was erected on a barge and picked up by a floating derrick and set accurately on the sand jacks which previously had been set with proper allowance for final settlement under the complete load.

The problem in slinging these centers was to keep them from jack-knifing. To accomplish this it was necessary to make a special device so that they could put positive compression on the pin at the crown and positive tension on the angle tie member across the span.

The sequence of steps in removing the steel arches was: 1. The sand jacks were lowered; 2. Both halves of the steel centers were secured to the concrete arch rib and the center pin was then removed; 3. Half of the center was lowered to the deck of the other scow; 4. The second half was lowered to the deck.

Sand Jacks

The structural details of these sand jacks are shown in one of the illustrations. The total load of 75 tons which they were required to carry gave compression on the sand in the cylinders amounting to 590 pounds to the square inch.

Piles

There were 7,000 timber piles and 428 concrete piles used in the piers. The piles for the water piers were driven with extension leads with an 11-B-2 McKiernan-Terry hammer operating under water. The extension leads were 65 feet long for the vertical and batter pile driving. The floating pile drivers were of all steel construction, equipped with 75-foot steel leads. These leads were pin-connected to the foundation sills so that they could be adjusted to the proper angle to drive the batter piles.

Piles in Piers 6, 7 and 8 were sawed off under water, using a special saw arbor carried in the leads of the pile driver. This saw rig adapted to the purpose by engineers of the Merritt-Chapman & Scott Corp., was built by the Lambert Hoisting Engine Co. The piles were sawed off at varying depth up to 40 feet below mean tide. Piers Number 7 and 8 are carried on 1,212 piles each, cut off 40 feet below mean water.

Cofferdams

The timber bracing for the cofferdams was built on the beach, launched, floated to position, and sunk in place. A total of 1,000 tons of Larssen No. 2 steel sheet piling was used to enclose the cofferdams. Time was saved and economy effected by flooding the cofferdams for the bascule piers and permitting the timber bracing to float upward as each successive pour was made in the piers, thus permitting the timbers constituting the bracing to be removed in their entirety in the open instead of being cut into small sections under pressure as is the method customarily employed. For the land piers, swinging leads were used to drive the sheeting.

Material Handling and Stores

To expedite the handling of the great quantities of material, it was necessary to provide extensive yard and storage facilities. A connection was installed to the main line tracks of the New Haven Railroad, which connection extended the length of the yard and supplied three sidings inside the yard. One of these sidings ran parallel to the bridge and over a trestle to Pier 8. A second siding ran to the cement house, and was so located as to enable unloading direct to cement cars discharging into the mixer. The third siding, running over a trestle, gave access to deep water and permitted direct handling to boats. A locomotive crane was continuously employed in the yard.

Personnel

The construction of the Washington Bridge was directed by the Washington Bridge Commission, a state commission, composed of Abram L. Atwood, Chairman; Robert G. McMeehan, Secretary; Benjamin F. Robinson, John W. Hanley, F. A. H. Bodington, Joseph P. Burlingame, Martin S. Budlong, Herbert E. Humes, Howard E. Ides. Clarence W. Hudson, Consulting En-

gineer of New York, was the Engineer for the Commission, with Carl L. Otto of New York as the Consulting Architect; Daniel O. Cargill of Providence, R. I., as Advisory Engineer, and G. H. Atwood, Resident Engineer.

For the general contractor, Merritt-Chapman & Scott Corp., Grover C. Denny was Superintendent from August 1, 1928, to March 1, 1930, at which time he was relieved to undertake the work that the company is doing in connection with the Mount Vernon Memorial Highway. At that time A. Rass was placed in charge as Superintendent and carried the work to completion.

The principal subcontractors were Phœnix Bridge Co., which fabricated and installed the structural steel and bascule spans; Joseph McCormick, who handled the excavating in connection with fill, paving, drainage for approaches, etc.; J. S. Packard Dredging Co., which handled the excavation of the river piers; Fowler Electric Co., which installed all power and lighting equipment; Gorham Co., which cast the bronze lanterns and memorial tablets, and George R. Hansen Co., which did the waterproofing. Rockford Granite Co., furnished all granite and supervised laying of granite block paving.

100 Working Days or Jumping the Gumbo

(*Continued from page 56*)

about 12 x 16 feet. It had chain and hook so that it could be hauled ahead by the trucks when necessary. The hot mix was shovelled from the board to the road by two gangs of five men each which alternated on the trucks.

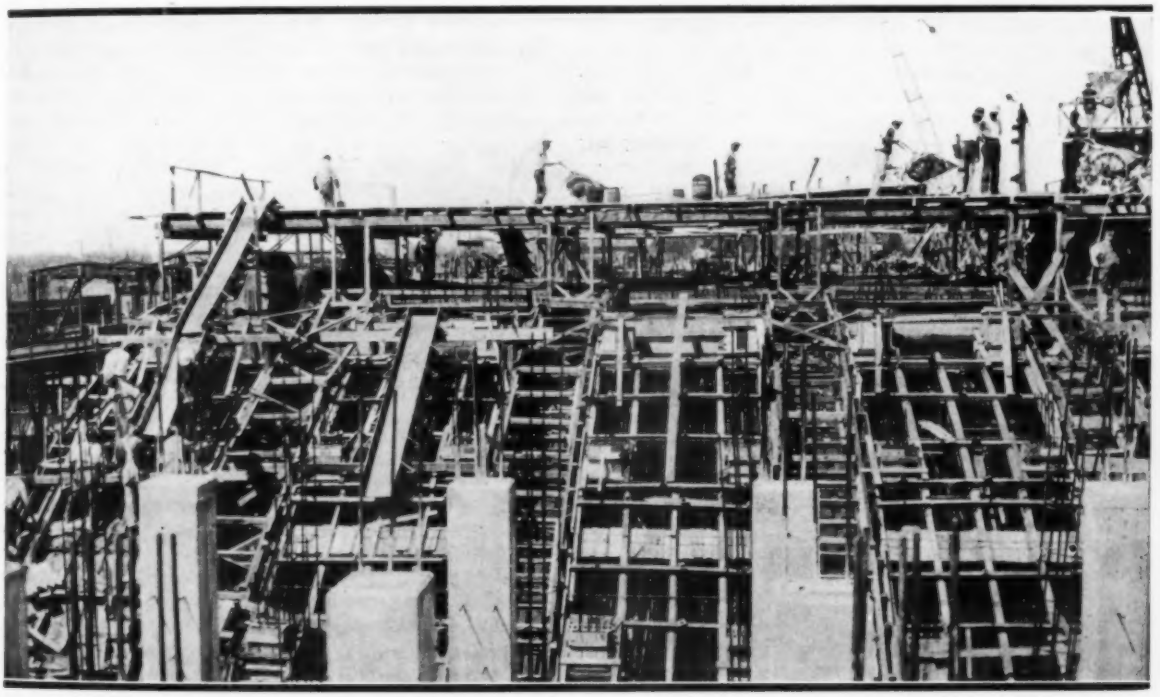
A Lakewood Type C screed with one operator spread and surfaced the hot mix following which it was immediately rolled while hot by two 10-ton Buffalo-Springfield tandem gas rollers. The finishing machine was run on angle rails for the base and flat metal rails nailed to the forms for the top course. The edge where the angle was removed was immediately raked and hand tamped before the rolling.

Three men made up the crew following the rollers. One straight-edged the pavement to locate the high and low spots and the other two men raked out the asphalt and corrected the elevation of the surface before the final rolling.

As soon as the base course was completed a squeegee coat of not less than 1/16-gallon of the same asphalt as used in the mix was spread over the asphalt by 2 men. The asphalt was kept hot in a portable Littleford kettle which the men pulled along the road, keeping it close to the work.

Quantities and Unit Prices

The total bid for the 13.27 miles of 16-foot sand asphalt road with the 3-inch base and 2-inch top, and including the shoulders which were paid as excavation of the original subgrade and not as a separate item was $171,000. There were 16,000 yards of excavation at 40 cents per yard, 8,000 yards of borrow at 40 cents and 124,360 square yards of sand asphalt at $1.30.



Placing the Concrete by Sections in the Arch Ribs. The Locomotive Crane on the Right Lifted the Buckets from the Cars on the Ground and Delivered the Concrete to the Hopper Serving the Buggies

Bonding New Concrete to Old

UNDER the above title the Department of Scientific and and Industrial Research, Building Research Board of England, has prepared a bulletin giving in brief form the more important conclusions and recommendations which have been possible to make as a result of experimental work carried out at the Building Research Station on the method of bonding new concrete to old. The booklet discusses normal portland and rapid hardening portland cement concrete, aluminous cement concrete, the bonding of different types of cement, the use of bonding solutions, and the location of construction of joints. Copies of this booklet may be secured from the British Library, 551 Fifth Avenue, New York, for 16 cents.

How the Other Fellow Did It

Construction Briefs

Hose Connections to Your Paver

55. Every paver is equipped with a single hose connection on either side controlled by a valve. Many contractors have greatly improved on this by inserting a T with two valves or in some cases a Y with two valves and maintaining two hoses so that as soon as the paver is approaching the limit of the length of one hose, the second one is attached to the next tap and while one valve is being closed the other one is being opened, making absolutely no delay in the mixing cycle. Another advantage of this is that should one hose suddenly become damaged, the paver always has a second hose already laid out on the grade which can be quickly put into service. On some jobs a second coil of hose will be carried on the roof over the operator's platform or on a small platform built above the drum.

On a Illinois job handled by an Iowa contractor, the paver was equipped with double hose connections. In discussing the advantage of the double connection, the contractor remarked that if a contractor will count the number of times a day that the paver operator has to yell, and that is putting it mildly, for water and holds up the paver for a few minutes, he will find that an extra hose connection and extra hose will be very helpful in cutting down lost time. The contractor does not cash in on his investment unless concrete is going into the road. There are times also when the pipe gang forgets to put in the valve where it belongs and there may be 400 feet of pipe without a tap. When this happens the two hose lengths right at the paver help a lot to save time, by simply coupling them together and stretching the distance to the next tap. 19.3.77

Snow Fence Keeps Sand Out of Excavation

56. On an interesting piece of construction in a very sandy area which was so much like the desert of Sahara that movie sets had been built from time to time for sheik pictures, some difficulty was experienced with the fine beach sand blowing into the excavation. When paving in this area was first started a strip of concrete was laid in the afternoon and when the workmen returned the next morning, the strip had been entirely covered up. On several of the excavation operations snow fence was used to keep out the sand and one shed was purposely built up 2 feet above the sand to permit the sand to go past it and thus prevent its untimely interment. The portable snow fence proved most efficacious in causing the sand to drift at definite locations, thus protecting excavations which had been made for form work. 19.2.61

Wider Base for Hot Mix Pavement Prevents Raveling

57. On most hot mix jobs both the base and surface courses are made the same width, but on a large job in Ontario, Canada, the forms for the base course, 3 inches in thickness were laid 21 feet wide and then picked up and laid 20 feet wide for the top course. The value of this procedure was that there was not a vertical wall 6 inches high to break down under traffic at the edge, but rather two layers of 3 inches each which would be more likely to stand up when backfilled with the shoulder material. The forms were 3 x 6-inch lumber with holes for the steel pins bored at each end. No pins were used at the center as the forms were well backfilled as laid and the base was well rolled before the forms were put down. About one mile of forms was laid ahead of the spreading. 19.3.56

Keep Your Trucks Running Even Though the Grade Is Soft

58. There is very frequently one place in a long stretch of subgrade that will be wet, either from a spring or which will seem to hold water longer than any other point. This isn't always at the bottom of a grade, either, as sometimes the worst mires are found at the top of a grade. Many devices such as metal troughs, corduroy and planking, have been used to overcome the miring of trucks at such points. One Iowa contractor left a considerable footage of planked strips for use wherever needed and found that, although the planking might wear out on a single job, it was a first rate investment as, during a wet season, spots where trucks mired developed very easily and one truck mired on the grade may hold up the entire fleet and keep the batches from reaching the paver regularly. 19.3.73

A Piano Wire Straight-edge

59. The usual straight-edge used on a road was thought by one contractor to be a little too cumbersome an affair and too tiring on the man using it. In order to lighten the straight-edge, but still retain its effectiveness and at the same time insure it against all possibility of warping, the unit was made up simply as a bowed strip of wood with a piano wire for the testing edge. The wire was held in position by a simple notched bent strip of metal at the ends of the bowed wood strip. 19.2.74

Monorail Bucket Handles Cement

60. On a concrete paving project north of London, Ontario, the contractor devised a very interesting method of handling the cement in his batching operation. The cement was delivered by contract at a definite number of bags per day. Inasmuch as the actual use of cement varied from day to day, a reasonably large storage shed was built with large platforms on either side. Cement was stocked on these platforms when delivered within the need for the current day. At the center of each of these platforms was a pair of monorails each with a bottom dump bucket which held the nine bags of cement for a single batch. These pairs of buckets were kept filled and, as the truck ran under them, the bottoms were prevented from blowing by canvas flaps tacked to the doors of the buckets.

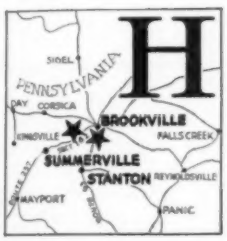
The cement was delivered to the batch after the truck had passed under the stone batching bin and received the two batches of crushed materials. Each bin was provided with two batchers consisting of wooden hoppers with controlling gates so that the minimum of time was lost in stopping the truck for its two batches.

One of the pairs of cement buckets had a timber running all the way from the front to the back to keep the two buckets from interfering with each other. The other pair had a post to separate them and this proved more efficient as one man could push the two buckets up over the truck at the same time without having to work his way over a center rail.

The trucks made three stops in securing the completed batch, but as each stop was succeeded by a forward movement, a truck was not in the plant for more than the allotted time except under unusual circumstances. The idea of "a truck a minute" was not lived up to, but the few extra seconds, practically never amounting to more than 10 seconds, did not delay the work. 19.3.75

Work *of a* Dixie Contractor *in* Pennsylvania

Hagedorn Construction Company, Brookville, Pa., Transplanted from North Carolina 3 Years Ago, Handled Three Contracts Near Brookville in 1930



HEAVY grading by subcontract, fine grading with mule teams and scrapers, and a concreting organization of colored labor that has been with the contractor for periods of from three to fourteen years, were typical of the Southern influence on the three contracts that the Hagedorn Construction Co., completed during the 1930 construction season near Brookville, Pa. The contracts were Sections 1 and 2 on Route 237, between Brookville and the Clarion County line, and a short contract extending for 4,700 feet from the Brookville line toward Stanton on Route 63. Section 1 was 21,545 feet long and Section 2 was 21,863 feet long, with a 600-foot Public Service Commission gap across the New York Central Railroad.

Sequence of Operations

Work was started on Section 1 of Route 237 early in September, 1929, and the heavy grading operations continued throughout the winter and spring. Concreting was started May 8, 1930, and during this time grading continued on Section 2 and on the job on Route 63. The concreting on Section 1 was stopped on June 23 to permit the paving of 4,400 feet of Section 2 as far as the gap, which was completed on July 3, and then the whole outfit was moved to Brookville, and between July 14 and 20 the 4,700 feet on Route 63 was completed and the outfit moved back to Section 2, and that completed. The batcher plant was moved from Summersville to Brookville for the paving of the work on Route 63 and to complete Section 2.

Heavy Grading on Section 1

The grading of all three projects was done by subcontract with A. J. Marshall, Brookville, Pa., who shipped in 10 carloads of equipment to handle the big cuts and fills. There were three ¾-yard Erie steam shovels, loading to Western 5-yard crawler wagons pulled by Caterpillar Sixties. There were two wagons for each tractor, and two of these tractor outfits for each shovel. The average haul was 2,000 feet. There

An Osgood Steam Crawler Crane Served the Butler Batcher Unit

were also two Athey 5-yard wagons, each pulled by a Caterpillar Thirty, and four extra trucks.

Two I-R compressors with Cleveland jackhammers did all of the drilling, the holes running from 12 to 14 feet, maximum depth, and with an average of 6 feet. The rock was shot with du Pont 40 per cent dynamite, and 60 per cent was used for mudcapping the larger stone to reduce it to sizes fit for the 4-inch layers on the fill as specified.

On the fills where the material was 100 per cent rock the subcontractor used ten men and on the dirt fills four men. The Western crawler wagons were bottom dump and the Atheys end dump, making a combination that greatly helped the quick building of the fills. There was one cut of 30,000 yards which was handled by one shovel and two tractor outfits with four extra wagons during February, March and one-half of April, 1930. Hagedorn's Osgood steam shovel, which was later used at the batcher plant, handled the excavation of about 1,000 yards of mine drift that was 100 feet long across the road and went 27 feet into the ground. The entire excavation was done with a ⅞-yard Blaw-Knox clamshell bucket. When the excavation was completed 160 feet of drain pipe was laid in the bottom and the whole filled with earth in 4-inch layers and rolled.

The Marshall outfit included seven tractors for the hauling on this job. There was a total of 60,000 yards of cut moved to fill within 4,000 feet. Most of the heavy grading was done in the winter with less than 10 per cent lost time, because of the use of tractors and crawler wagons.

Concrete Structure Built in Winter

Having had most of their work in the South the Hagedorn Construction Co., found considerable novelty in building a 12-foot diameter concrete arch culvert, 98 feet long and on a 45-degree skew in winter, when all the aggregate had to be heated and the entire structure enclosed in a canvas tent and steam heated throughout the work. The structure was beneath a heavy fill, and the pouring of the work in winter saved considerable time in placing the fill. The costs were high, but the operation on the whole was economical, because it saved a bad delay in beginning the paving in the spring.

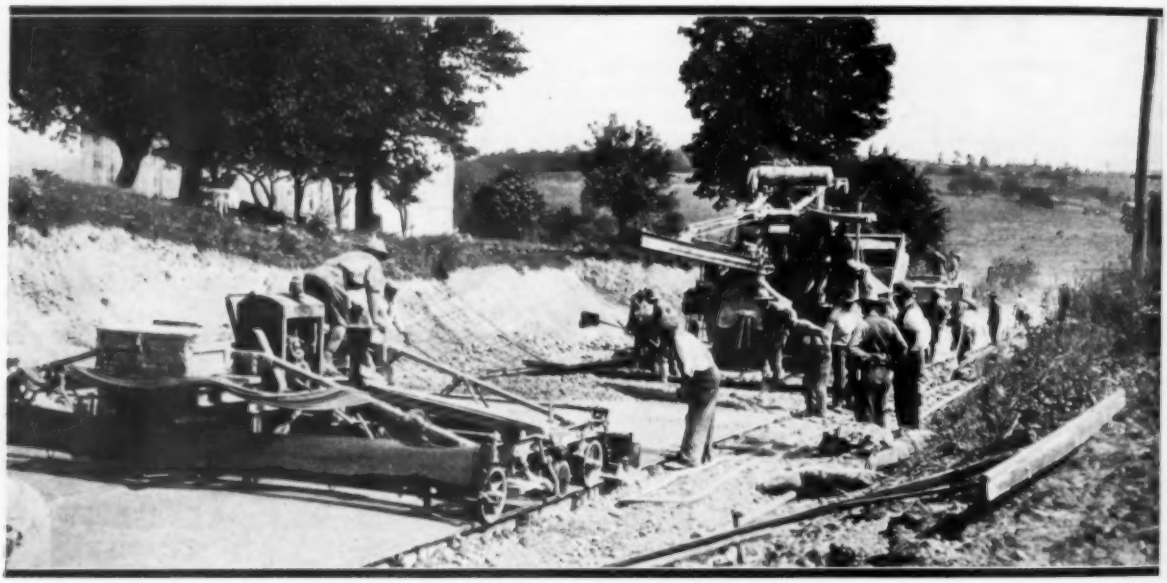
There were other barrel culverts in the job, but they were put in during seasonable weather, as the fills were light and could be rolled to compaction quickly. One of the culverts was 16 feet in diameter and 54 feet long.

Another piece of winter work was the removal of 30,000 yards of excavation from a 500-foot cut having a depth of 44 feet. In the cut were found seams of good coal which was used at times in the steam shovel fires.

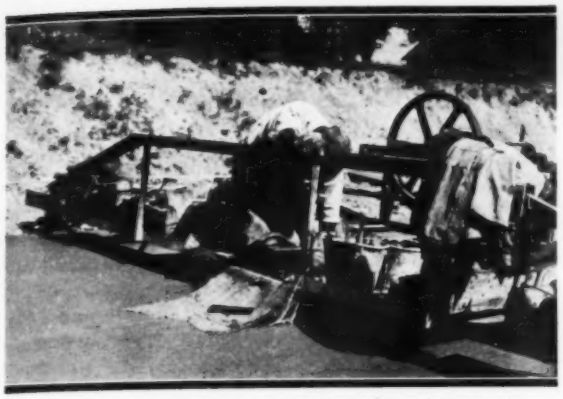
Preparing the Rough Grade for Winter

When there is considerable grading and fill to be placed on a Hagedorn job at a time when it will be subjected to the winter thaws and spring rains, it is the practice of the company to leave the shoulder dirt on the grade, crown it and thus protect the grade from erosion during the time of heavy rain. If the dirt is left on the shoulder the water soaks the grade and causes considerable washing that has to be repaired in the spring. With this method a heavy grader is put in when the time arrives for the concreting and the extra dirt moved to the shoulders, where it stays and is finished off with another grader and hand trimming after the slab is in. The blading in the spring is to within 2 inches of the final grade, another little detail that makes a lot of difference in the amount of work to be done by the fine grade crew.

The grading on Section 2 and on the Route 63 job was much lighter but was handled in much the same manner, so it will not be detailed here. Similarly the concreting operations on the Route 63 project will be described as typical of the organization on the other operations, as the same crew handled all the work.



Pouring and Finishing the Last Lap, a Down Hill Stretch of Only a Few Hundred Feet. After This Was Completed the Entire Crew Went to Another Job Nearby with Scarcely a Day Lost



No Wasted Labor on the Cleft Machine. A Piece of Burlap Hung on the Rear of the Machine Was Weighted and Gave a Perfect Finish Over the Center Joint as the Machine Moved Forward

SPECIAL MIX USED ON SHORT SECTION

While most of the work on these projects was poured the full 18-foot width in one operation, there was a stretch that was poured as a 9-foot strip in order that it might be of sufficient strength to carry the contractor's equipment when the outfit returned to pour the second section. The strip was 1,300 feet long, and the regular mix of 1:2:3½ was changed to 1:1½:2½, and the time of mixing from 1¼ to 3 minutes. The same Penn-Dixie cement was used as went into the entire job. No calcium chloride was added to the special mix as was used on the other work, but this special concrete was cured by covering with double thicknesses of burlap and wetting continuously until the proper strength had been secured on the test beams.

On account of the Baxter traffic only half width was required. The special mix was required not by the State specifications, but was done by the contractor for his own convenience. For this, the State designed the special mix which was used. The tests on the beams were interesting, showing the value of the extra time in mixing. The regular standard mix gave an average modulus of rupture of 537 pounds per square inch in 7 days, while the special mix gave a modulus of rupture of 520 pounds per square inch in 24 hours, 665 in 48 hours, and 715 in 72 hours. Based on these tests, the pavement was opened to 13-ton traffic in 4 days.

With the standard mix the contractor poured 21,448 feet of the slab in 286 mixer hours, or an average of 74.64 feet per mixer hour. This last construction season is the first that the State Department of Highways of Pennsylvania has maintained an efficiency record to compare the work of the various contractors handling state highway work on the 200 odd jobs under way. The Hagedorn Construction Co., maintained a high rating throughout, the work being first, third and fifth during one period and in the upper ten all of the time.

THE TYPICAL BATCHER PLANT SET-UP

The batcher plant set-up in Brookville was on a spur track, practically in town and close to the job, giving a minimum dead haul. The Butler weighing batchers were set so that the trucks could back beneath them, but there was not sufficient headroom under the batchers to permit them to drive forward under them to reverse the position of the wet sand in the bodies.

The stone was supplied by the Templeton Limestone Co., Templeton, Pa., and the sand by the Allegheny River Sand Co., at Kittanning, Pa. The aggregates were unloaded by an Osgood steam shovel with ⅞-yard Blaw-Knox bucket. The individual batches were made up of 1,890 pounds of stone and 1,236 pounds of sand. For a portion of the work on Route 63 slag was used for the coarse aggregate and 1,530 pounds of the slag were used in place of the stone. Upon leaving the batcher the trucks ran to the cement car, where three men loaded the six bags of Penn-Dixie cement on each batch. The contractor's organization at the batchers consisted of two men in the cars cleaning up, the craneman and a fireman and the batcher man.

The batch hauling was done by subcontract by R. R. Bell, Sharon, Pa., who had a fleet of ten International trucks and one White truck. The trucks hauled three batches per load.

ROUGH GRADING ON ROUTE 63

The rough grade on the 4,700-foot stretch of paving on Route 63 was handled by a Lorain 75, 1¼-yard gas shovel, loading to six hired Mack trucks which had an average haul of 1,500 feet. The fills were spread with a Caterpillar Thirty and bulldozer and smoothed with a Galion 10-foot blade grader. The fills were laid in layers of not more than 4 inches in thickness and rolled with a 10-ton gas roller. From ten to twelve men were used for the rough grading work, including all the truck drivers and operators.

HOW A NEAT GRADE WAS PRODUCED

Typical of the operations of a Dixie contractor, ten mules with Western scrapers were used on the fine grade to move dirt from high to low spots, and generally to clean up. The long, even cuts were made with a Caterpillar Thirty pulling a Russell Super-Special grader with a 9-foot blade. This outfit put the grade within 2 inches of the final grade.

FORMS TRUE TO LINE AND GRADE

A total of 3,400 feet of Blaw-Knox forms were used on the job on Route 63 which was an 8-6-8 inch section, 18 feet wide. Three form setters were used ahead and three behind, close to the paver, realigning the forms.

The Burlap Was Brought Forward Folded, Was Spread on Hand Litters and Kept Soaking Wet Before Spreading on the New Concrete. A Very Good Preventive for Hair Checking in Hot, Dry Weather

The Burlap Was Laid Longitudinally so That Little of the Surface Was Exposed When Trimming the Center Strip with a Straight-Edged Shovel

A crew of twenty laborers cut the trench for the forms by hand, and used the templates to check the grade from the forms. The first template was ½-inch high, the second ¼-inch high and the scratch template at the paver was set ⅛-inch high, or practically at the true grade.

The fine grade crew which worked just ahead of, and within the forms, consisted of fifteen men and a foreman. One mule team with a scraper and a Highway Patrol grader were used to move dirt between the forms, as needed to bring the grade and contour to line. A 10-ton Buffalo-Springfield steam roller and a Galion 5-ton gas roller were used on the final grade. Great credit is due the contractor for the excellent grade that was produced, even with very poor material, under some conditions. The grade was firm in spite of very dry weather. The secret of that was that he sprinkled the grade for at least 500 feet ahead of the paver to keep down the dust and prevent cutting of the grade by the trucks.

The grading on this project was started April 4, 1930, and the first concrete poured July 14 and completed in one week. The project was just 4,700 feet long. The contractor hired his grade men by the hour and paid no money for the noon hour. The concrete and curing crews were paid by the hour with no time out. The men ate their lunches as best they could during the period from 11 to 1. The foremen were hired by the month and received overtime for all over 10 hours work per day.

Two sections of form were removed about 500 to 800 feet ahead of the paver to permit the trucks to turn and back to the paver. Two men were employed dumping the cement from the bags into the batches after the trucks had turned, and one man on the road baled the sacks for return to the manufacturer.

CONCRETING CREW ALL OLD-TIMERS

The crew that put down the slab were all men who had been with the contractor for periods from 3 to 14 years and knew their work perfectly. The word of the superintendent was law, and they never doubted him. One man dumped the trucks and batches into the skip of the Rex 27-E paver, which carried an operator and calcium chloride man. There were four pit men and two spaders as well as two men cleaning up and handling the placing of the Truscon Barmat reinforcing and the cross dowels, placed every 5 feet, and the 9-foot reinforcing placed at each expansion joint. These bars were wired to the Barmats while they were still on the shoulder.

The center strip was placed with a Cleft machine by an operator and a helper using Elastite premoulded strips. The center strip machine was preceded by a Lakewood screed, and the hand finishers, of which there were three, two for floating and burlap belting, and one for edging both sides of the slab. Two men placed the burlap from two bridges, running the strips longitudinally so that the edge could be touched up by moving but one piece of burlap on a side and so that the center joint could be cut by one man with a shovel the next day as early as desired, without interfering with the curing of the remainder of the slab according to specifications. The man who cut the center strip used a straight-edged shovel and bore down on the top with his foot, thus removing any little irregularities in the concrete on either side of the strip which had not hardened sufficiently and which would have had to be ground off if left until later. The center strip was placed in the usual way, but at the back of the machine was a strip of burlap, weighted to keep it against the concrete, which gave the small section at the center which had been disturbed by the insertion of the center strip the same texture of finish as the remainder of the pavement.

The burlap for curing was brought forward by two men, who spread it on platforms and wet it down with the hose so that it was damp when spread. This is a very good scheme to minimize the chance for hair checking in the early curing of the slab. There were two men back, sprinkling the burlap that had been laid.

A crew of seven men and a foreman took up the forms, covered the sides of the pavement and maintained the pipe line for the water supply, disconnecting such pipe behind the paver that would not be needed for sprinkling or for water supply for pouring headwalls after the pavement was completed. The form setting crew kept a double line of 700 feet of forms ahead of the paver at all times. The paver regularly turned out 800 to 850 feet of slab on this job and made about 37 batches per hour.

PLENTY OF WATER ALL THE TIME

A Worthington triplex pump, belt-driven by a 35-horsepower, 4-cylinder gas engine, furnished the water for the paver and curing. A pipe line of 2 and 2½-inch pipe was used with taps for the paver hose every 120 feet. The paver carried 225 feet of hose and a check valve on the paver to prevent the water flowing out of the line

SOME DIFFERENT WAYS OF DOING THINGS

It is always of interest to see the way that different contractors handle little things on the job to effect the saving of a few cents here and there, to make up the dollars that roll into profits. As it is the avowed endeavor of CONTRACTORS AND ENGINEERS MONTHLY to tell its readers about these things we are pleased to describe a few things from the Hagedorn job through the courtesy of the Superintendent.

The scratch template at the paver was originally a Blaw-Knox unit, but it was found that under the bucket of the Rex paver it was causing trouble catching on the bucket when both were close to the paver. The wheels of the template were set higher, thus throwing the template surface lower and the bucket was cleared. This saved a few seconds every time the paver was moved, but seconds mount into minutes in the course of the day and finally the run is cut by a number of feet each day.

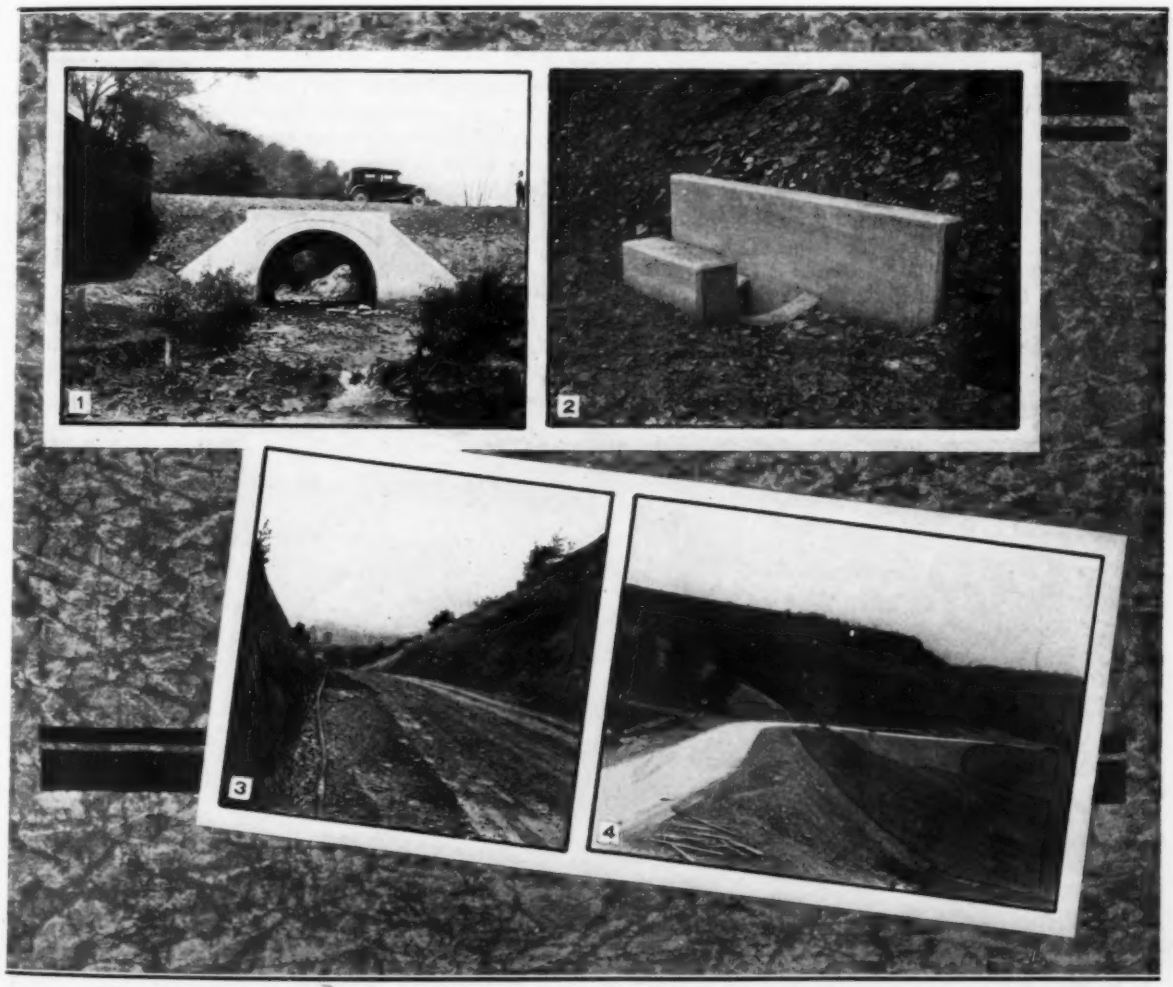
As the clean-up men and the final grade crew were not infrequently in need of picks in a hurry in spite of the care taken with the grade, several picks were hung on the paver bucket where they could be reached in a second to pull up the offending stone or other part of the grade that was marked by the scratch template.

All gasoline for the paver and finishing machine was brought out to the machines in 5-gallon cans instead of having a drum of gas on the grade. The experience of this contractor and many others is that gas on the grade is a potential source of danger, for if a couple of husky laborers take it into their heads to pour directly from the drum into the paver gas tank, a slip of the drum and there is liable to be a disastrous fire. Safety first!

A square not unlike those used by carpenters, but made of 2 x 4 lumber and heavily bolted together was used to insure that the expansion joint was square with the line of the forms, both vertically and horizontally.

The expansion joints, which were put in approximately every 250 feet, were cut uniformly to ½-inch below the top of the pavement with a pick sharpened to do this work with the minimum of labor. The joints were then poured with asphalt according to specifications.

(Continued on page 94)



DRAINAGE STRUCTURES AND GRADING ON A WESTERN PENNSYLVANIA CONTRACT

1. A barrel culvert of 16-foot span and 54 feet long. 2. The headwall of a drop inlet at the base of a rock cut. 3. A cut 500 feet long, 44 feet deep from which 30,000 yards of material were removed in February, March and April, 1930, by one steam shovel using coal, in part, taken from seams in the cut. 4. A 30,000-yard fill completed in thirty working days

Earth Dam *with* Corewall *to* Impound 4 Billion Gallons

By

Thos. H. Wittkorn

FOR the amount of material being handled and the particular way in which it must be placed, the outstanding feature in the construction of an earth dam 2,000 feet long with a concrete corewall, in Delaware County, Pennsylvania, is the small number of men employed on the job. Construction, nevertheless, has continued ahead of schedule, due partly to the favorable weather but more to the efficient methods used.

The undertaking involves 600,000 yards of cut and fill, placing 90,000 tons of rip-rap and paving stone and pouring 30,000 cubic yards of concrete. During July, 1930, work progressed at the rate of 3,200 cubic yards of earth fill, 100 yards of concrete and 600 yards of stone every 24 hours, and the pay roll showed 140 men on the job.

The contract was awarded to the American Pipe & Construction Co. by the Philadelphia Suburban Water Co., which supplies a rapidly growing section west of the city. The dam is to make a gigantic reservoir in the Crum Creek valley about 13 miles from the city. The present level of the stream will be raised about 70 feet and inundate over 400 acres, making a reserve supply of 4 billion gallons to care for the future needs of the water company. This new supply will be 2½ miles above the present basin and pumping station of the company on the same creek.

Six-Yard Wagons vs. Trucks

By far the largest quantity of earth was moved by six 2-wagon tractor trains for a distance between 2,000 and 4,000 feet. One Monarch 75 and five Caterpillar Sixty

General View of the Upstream Face of the Dam Showing the Corewall and the Placing of Embankment and Rip-Rap

tractors were used to pull the trains. Six of the wagons were LaPlant-Choate and six were Western. Two Bucyrus-Erie and one Thew-Lorain shovels were used, cutting into the hills in front of the dam and loading the trains with 12 to 16 yards of earth which they moved to the fill.

In the early part of the summer of 1930 all three shovels were used and a fleet of ten large trucks was hired at the rate of $2.50 an hour. It was found, however, that the trains were moving the fill more economically than the hired trucks so they were discharged and just two shovels used to handle the trains and four of the contractors own trucks.

Placing the Fill

The earth fill was placed on both sides of the corewall at the same time in equal amounts. The greatest width of the dam is 375 feet and from this it tapers to a little more than 40 feet, the width of the concrete state highway which will cross on the top and form the connecting link between Media and Newtown Square.

Particular care was taken in placing the fill. The loads were dumped in rows and then leveled by bulldozers. All sods, stones and bits of rubbish were carefully picked up by gangs working with two steel mules, one mounted on a Fordson tractor and one on a McCormick-Deering tractor, so as to eliminate every possible chance for settling.

Each layer of fill was rolled twice by one of the 12-ton Buffalo-Springfield gasoline rollers and then well sprinkled with water from a 500-gallon tank which was mounted on a Mack truck and fitted with a spray boom as shown in a photograph. Where the earth was placed against the corewall it was thoroughly packed by men with heavy iron tamps. Every care was taken to make the fill solid and laid uniformly.

Nine-hour or Ten-hour Shifts?

Two 9-hour shifts worked on the fill. Two 10-hour shifts were tried, but it was found that the machinery did not have sufficient time to cool off to get the best results from it. Sprinklers were kept busy all the time over the whole job in order to keep down the dust but even with them, dust and heat were factors which had to be reckoned with.

The Concrete Corewall

The concrete corewall which extends the full length of the dam, is tied into solid rock at each end. It reaches down to bedrock and has a maximum height of 94 feet. Grout holes on 32-foot centers were sunk an additional 20 feet into bedrock and filled under pressure to insure a stable foundation for the wall. These holes measured 3¼ inches at the top and tapered to 2⅛ inches at the bottom. Ingersoll-Rand compressor equipment was used for sinking the grout holes in bedrock and all the other jobs where air was needed. Gardner-Denver and Ingersoll-Rand drills, with steel up to 20 feet long were used. Forty pounds pressure was used for grouting and every hole was grouted to refusal.

When the corewall was started an open cut was made so that the grout holes could be drilled and the forms placed for the wall. The wall varies in width from 15 to 7 feet at the bottom and tapers to 2 feet at the top. A mixture of 1:3½:5½ was used without reinforcing. All the sand and gravel used for the concrete was furnished and hauled by Warner Co. about 18 miles from one of its yards in Philadelphia. Large 6-wheel trucks were used, carrying about 9 tons per load. They made four trips a day and the drivers are paid for 11 hours' work.

The large quantity of water required for the various operations was supplied by a vertical steam boiler and a 10-inch stroke pump on the bank of the creek below the dam. It filled tanks at certain high points and pumped direct when a line was opened to fill one of the sprinkler trucks.

In the early stages of the construction it was necessary to lay industrial track and use flat cars with a gasoline locomotive to haul the concrete in buckets from the mixer to the forms. As it rose above the surface and the fill made solid ground on which to travel, motor trucks offered a better way to distribute the concrete.

Each truck carried two 2-yard buckets which were filled by running the truck with them under the end of the chute from the distributing tower of the mixer. At times the buckets are not filled to capacity as the boom of the Erie steam crane could not handle them because of the angle at which it was forced to work.

The Central Mixing Plant

The mixing plant was located along an improved highway and occupied the hillside site of a former barn. The old walls made a good bin for the sand and gravel into which the trucks could dump without leaving the main road.

A 2-yard Koehring mixer with an automatic timer was used. One man with a steam-operated clamshell bucket was responsible for keeping the hopper full of sand and gravel. He also moved the supply piles back so that the trucks could dump when the material was received faster than it was being used.

The cement house was at the extreme left and was also on the public highway, making it easy to unload the trucks which brought this material in sacks from the mill at Conshohocken. Two men emptied the bags into the cement carriage on a track below the floor level. When it was full a slight push started it by gravity to the mixer. For its next load, the carriage was pulled back again with a rope by one of the men in the cement house, without leaving his position.

It required one man to run the mixer, another to feed it, and at times a third man on the tower to regulate the flow through the chute. The steam hoist operating the bucket in the 90-foot tower was run by one man. There were eight men on the mixing force.

No attempt was being made to establish a speed record in pouring the concrete. The plan was to keep the corewall just far enough ahead of the fill so that the one crane could do all the work at practically the same level all the time.

Form Work

Some wooden forms were used in the construction of the wall, but most of the wall was built with ten 10 x 10-foot Blaw-Knox forms. A section of wall 10 x 50 feet was allowed to set for 24 hours before the form was moved. They travelled on wheels on a steel track making it to move them ahead.

EQUIPMENT ON THE AMERICAN PIPE AND CONSTRUCTION COMPANY CONTRACT

1. *Six-wheel Mack truck delivering a 9-ton load of sand after an 18-mile haul from Philadelphia.* 2. *General view of the job showing concrete mixer, stiff-leg derrick and clamshell which supplied sand and gravel to the batcher, and in the foreground a tractor train with 13 yards of fill.* 3. *Moving the Blaw-Knox steel forms forward with an Erie steam crane.* 4. *A Thew steam shovel loading a tractor train with earth for the fill on either side of the corewall.* 5. *A Caterpillar Sixty tractor bulldozing fill into a uniform layer. The corewall is shown in the background.* 6. *The upstream side of the dam showing a key in the corewall for the next section to be poured. This truck with a 500-gallon tank kept the fill moist to speed up compaction and to lay dust*

When a point was reached where all the forms had to be shifted to another part of the wall, four men in a day could unbolt everything and the crane then lowered the sections onto skids. A Caterpillar Sixty tractor then hauled them to the new location and they were quickly reassembled.

OTHER CONCRETE WORK

Another item which required considerable concrete was the circular tower from which the flow of the stream will eventually be controlled. It is 90 feet tall and 12 feet inside diameter. The walls vary from 3 to 2 feet in thickness and are set back twice. It will be connected by a bridge with the finished road across the dam.

During the construction of the reservoir the stream was controlled by a 10-foot concrete conduit, shown at the base of the tower. It is about 400 feet long and runs under the full length of the dam. A 3-foot pipe will be laid through it to draw water from the reservoir when it is finished.

At its lower end the pipe will turn upward and discharge into a large masonry basin so that the water will be aerated before it starts its trip down the present creek bed to the pumping station located about 2½ miles below.

Both faces of the dam are protected with a covering of rip-rap stone. On the upper side this is a uniform thickness of 5 feet from the top to the bottom but on the lower side it varies. For 25 feet up from the base it is 6 feet thick and the rest of the way it tapers until it forms only a 1-foot covering at the top. This stone, 90,000 tons, was supplied by two local quarries which delivered it in motor trucks on a tonnage basis. As the earth fill progressed the trucks hauled it in and by merely dumping practically built the covering except for a small amount of hand labor.

OTHER EQUIPMENT

The contractor used six Mack dump trucks and four Federal dump trucks of its own about the dam. When trucks were being hired about every known kind had a representation. Three 10-ton Caterpillar tractors were used for road work around the operation and an Allis-Chalmers Monarch 35 was used for hauling the gasoline tank and the hundred and one other things which had to be moved.

THE SPILLWAY

A spillway to take care of the surplus water after the reservoir has filled is being built over a rocky ledge well to one side of the dam. It is of masonry construction and has a capacity of 12,000 cubic feet a second, which is far greater than any known flood in this territory.

The new highway after passing over the dam breast will cross the spillway channel on a bridge, giving travelers a good view of what will be a wonderful cascade at certain seasons. A new course will be cut back to the creek bed for this overflow.

LABOR AMPLE

The labor supply from the start of the project was ample. Hardly a day passed but what several applicants had to be refused although the job is located off the beaten track. Common labor received 45 cents an hour, tractor drivers 60 cents, carpenters 75 cents, foremen with gangs 80 cents and shovel men one dollar.

The contract calls for completion of the reservoir by April, 1931, and will represent an expenditure of $2,500,000. It will form a lake 3 miles long and in places ½-mile wide. The water company has already adopted a reforestation policy at its other basins and plans to add to the natural tree growth around this basin not only for the beauty but for the advantages which a heavy planting will give.

PERSONNEL

For the American Pipe & Construction Co., H. W. De Graff is General Manager with B. T. Kenyon as Assistant Manager; B. H. Coleman, Superintendent; D. C. McKay, Assistant Superintendent; and C. L. Brownell, Construction Engineer. H. S. R. McCurdy is Chief Engineer of the Philadelphia Suburban Water Co. and Thomas Hodges, Resident Engineer.

An Outline of Boulder Canyon Project on the Colorado River

(Continued from page 54)

from 1918 to 1924, by the U. S. Bureau of Reclamation. The tentative plans, estimates and other data, worked up by the Bureau, under authority of Elwood Mead, Commissioner of Reclamation, were reviewed and reported on in 1928 by the Colorado River Board, appointed by the Secretary of the Interior. This board comprises the following: Major-General William L. Sibert, Chairman; D. W. Mead and Robert Ridgway, consulting engineers; W. J. Mead and Charles P. Berkey, consulting geologists. This board's report, submitted to Secretary Ray Lyman Wilbur in November, 1928, was followed by the selection of the dam site in Black Canyon.

The plans for the project, involving the design of the dam and tunnels for diversion, spillways and power, and other phases, were drawn in the offices of the U. S. Bureau of Reclamation, at Denver, of which Raymond F. Walter is Chief Engineer.

MOST OF THE WORK BY CONTRACT

The principal phases of work on the entire project will be awarded by contract, in which cases the contractors, and not the Government, will be the employers of skilled and unskilled labor, and the purchasers of equipment. However, the Interior Department, acting through the Bureau of Reclamation, will purchase such materials as cement, steel, lumber, pipe, gates and valves, and will maintain an organization to handle inspection, engineering and supervision.

SAND AND GRAVEL DEPOSIT NEAR DAM

Aggregates required for the concrete, it is anticipated, may be taken from Hemenway wash, a sand and gravel deposit 2 miles wide and 10 miles long, situated on the Nevada side of the canyon, near the dam site.

Walker R. Young, resident construction engineer for the Bureau of Reclamation, opened an office at Las Vegas in July to assume charge of the preliminaries relative to railway extension, provisions for housing, and power for construction.

Lassiter Licks the Subgrade— . . . with a Big Stick

Final Grade Problem Solved with a Timber Mounted on Wheels and Carrying Blades on 7.1-Mile Sand Asphalt Paving Job

IT'S the little things that count in speeding up paving operations and when a contractor can make a little more speed with a little less expense he is bound to find a better balance in the profits column. The Robert G. Lassiter Co., Raleigh, N. C., was the successful bidder on the 7.1 miles of 18-foot sand asphalt paving on North Carolina State Route 30 between Shallotte and Supply. This is a main traffic highway for Florida-bound vehicles and with the improvements at Wilmington in the form of bridges completed last year to replace an inadequate ferry service the new facilities provided will inevitably attract increasing traffic.

The Big Stick

The old road consisted of a 9-foot bituminous macadam surface, in poor condition, with wide shoulders. This pavement was broken up with the scarifier attachment on the Russell grader which was pulled behind a Caterpillar Sixty. Where the scarifier teeth would not reach deep enough into the old pavement to thoroughly break it up a Wiard plow was used behind the tractor and this completely broke up the material.

The old shoulders were bladed out with the 12-foot blade on the Russell machine to a depth of about 14 inches and 3 feet in width. Into this shallow excavation the broken-up bituminous material was bladed to give a uniform stone base across the entire width of the new 18-foot pavement. In order to make it possible to get an even final subgrade for the sand asphalt base about 1 inch of sand was placed on top of the stone. This should provide a subgrade that will furnish an adequate pavement foundation for a long period even under this comparatively inexpensive type of paving.

Now for the Big Stick! As a means of quickly cutting the subgrade to within ¾-inch of the final grade the contractor built a novel piece of equipment that cost, on this job, only $30, and that was for the 16 x 16-inch timber 18 feet long which carried the flat cutting blades. At the ends were steel shoes so that the beam would run easily along the forms. The whole affair, which weighed about 2 tons when there were 6 men riding it, was mounted on a pair of large diameter wheels so that it could be easily moved to and from the forms. When in action the beam was pulled by a Caterpillar Sixty tractor and in 30 minutes at the end of the day when the last batch truck had left, about 1,500 feet of subgrade was planed and ready for work the next morning. When earth accumulated too deep in front of the blades the whole beam was simply lifted on its wheels and scrapers run in to remove the earth. The cables for pulling the scrapers were 40 feet long so that they could be slacked off and the scrapers run in to remove or supply earth to the grade as needed.

The Hot Mix Plant

The asphalt plant was located about 1¼ miles from the north end of the job. Asphalt was hauled from Wilmington, a distance of about 25 miles. The Standard Oil Company of New Jersey delivered the asphalt in tank barges holding 450 tons at Wilmington where they were pumped out to a 300-ton storage tank belonging to the contractor. A single Chevrolet truck with an extra pair of close-coupled rear wheels carried a tank with a capacity of 4 tons and hauled day and night to the reserve tank at the plant which had a capacity of about 65 tons. The hauling truck made about 10 trips in 24 hours hauling a total of about 40 tons a day.

The asphalt plant consisted of a Broadfoot Iron Works drier to which the wet sand was delivered by two Ford dump trucks which hauled from an Erie steam shovel working the deposits in the vicinity of the plant. The sand was dumped from a ramp above the bucket elevator which lifted the sand into the drier. The drier was heated by an oil flame, pressure for which was supplied by the steam boiler which heated the asphalt. The drier, elevators for both wet and hot sand and the mixer were run by a Fairbanks-Morse 75-horsepower diesel engine.

The hot sand elevator and the sand bins were built by the contractor and equipped with a Iroquois mixer. The entire plant was arranged in a crescent-shaped lay-

out with the sand ramp and drier farthest from the road and the asphalt storage tank nearest to the highway.

The operating crew for the plant proper consisted of 1 man to control the rate of feeding of the sand, 1 temperature man, 1 weigh box man, 1 engineer for the diesel engine, 1 day and 1 night fireman for the steam boiler, 2 men wheeling lime dust when running top, and 1 handy man who helped the night fireman check over the plant for possible trouble.

The plant was lighted by a Delco plant at night but several carbic lights were maintained ready for any emergency when the lighting system might fail or if extra light were needed at any one place.

The limestone dust was delivered by freight to Bolivia, N. C., about 9 miles from the plant and trucked in to the storage house from which it was wheeled by the two men allotted to that work.

MAKE-UP OF BATCHES

The 1-ton batches which were mixed at the plant and delivered to the trucks which hauled four at a time were made up as follows: for the base, which was laid 3 inches thick, 1,840 pounds of sand and 160 pounds of asphalt of 50-60 penetration; for the top, which was laid 2 inches thick, 1,600 pounds of sand, 190 pounds of limestone dust, and 210 pounds of asphalt.

The hauling was done entirely by contract with the **A. G. Boone Co., one of the largest hauling contractors** in the South, who uses United trucks equipped with steel bodies and Wood hydraulic hoists exclusively.

THE PLANT WHICH PRODUCED THE MIX FOR 1,200 *FEET OF BASE OR* 1,600 *FEET OF TOP PER DAY*

1. The sand drier, pugmill mixer and hot storage bins in a grove of pines. 2. The ramp to the drier. Trucks delivered the sand from the pit to the drier over this ramp. 3. Delivering a tank-load of fuel oil for the drier. 4. The asphalt truck delivering its load of material to the 65-ton storage tank after a haul of 25 miles

The trucks hauled the 4-ton loads to the road and then returned to the plant where the steel bodies were swabbed out with a mixture of kerosene and water to prevent sticking of the hot batches. Ten trucks were used on this contract.

THE FINE GRADE GANG WIELDED THE BIG STICK

The fine grade gang consisted of 10 men who shaped up the grade by hand and then were followed by the form setting gang of 10 men. The forms were 2 x 8-inch planks 12 to 16 feet long and supported with stakes, cut from 2 x 4's, every 2 feet, the forms being nailed to the stakes with 20d nails. Both the forms and the stakes were left in the ground. The fine grade crew came back after the forms were set and ran the Big Stick along the forms when the road was clear, usually at the end of the day's work and like a flash put the grade in final shape for the hot stuff. The grade was rolled by a 8-ton Buffalo-Springfield gas roller.

PLACING THE SAND ASPHALT

After the final check board had been run over the forms to insure the correct contour for the subgrade the trucks with the hot mix came up, were turned on a Blaw-Knox turntable because the weight of the truck and its 4-ton load would have tended to cut up the subgrade badly in turning and cutting around. A 10 x 12-foot steel pan was provided to receive the mix when dumped. It was immediately shovelled into place by 5 shovellers and then screeded to contour by a Lakewood single screed finishing machine. When work was stopped for even a few minutes a quart of oil was poured onto the back of the screed and fired to heat it so that it could satisfactorily work the asphalt.

The asphalt laying crew consisted of the man who dumped the trucks, the 5 shovellers, the operator of the one Buffalo-Springfield gas roller which was used on the base and a second one for the top, the finisher operator, 2 men straight-edging and raking the edge and hand tamping it to consolidate it where it would not be advisable for the roller to work too close to the forms. There were 2 men, one on either side who did nothing but move ahead the angle rails used for the finisher to run on for the base course and the straight rails for the top course run.

One man squeegeed the base course the morning following the laying, using hot asphalt of the same penetration as used in the mix. This one man, who replaced the two used on most jobs of this type, managed the

(Continued on page 77)

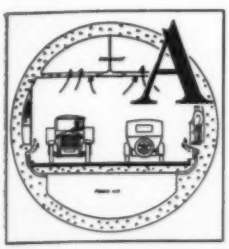
PREPARING THE GRADE AND PLACING THE SAND ASPHALT

1. "The Big Stick" showing the cutting plates and the steel shoes for riding the forms. 2. The grade ready for the heavy home-made subgrade planer. Note the shoulders already complete at the right of the forms. 3. The Lakewood single-screed finishing machine ironing out the surface. Note the shovellers at the left and the closeness of the machine to actual spreading operations. 4. Hand tamping the narrow strip of base along the forms where the screed could not finish without striking the forms

Novel Methods of Construction Used on the Detroit-Windsor Tunnel

New Link Between Canada and the United States Opened This Month

By Harvey Klemmer



A RIVER tunnel built on dry land, launched in sections like ships and sunk by its own weight, has been completed under the Detroit River. The tunnel joins Detroit with Windsor, Ontario, marking the first time that a vehicular subway ever has been constructed between two nations.

The Detroit and Canada Tunnel has been under construction two and a half years and was thrown open to traffic this month. It is approximately one mile in length between portals, carries a 22-foot roadway and has a capacity of 1,000 vehicles an hour in each direction. The cost is approximately $25,000,000.

Methods of Construction

Three major methods of construction were used in building the Detroit and Canada Tunnel. The three major tasks in turn were divided into five sections. Sections 1 and 5 were the usual box-type of subway, with steel bents and concrete jack arches, which were constructed by the open cut method. This method of construction was used on both of these sections, one at each end of the tunnel, up to a depth of 53 feet below street surface. Sections 2 and 4, adjoining the open cut excavation at each end of the tunnel, were constructed by the shield tunneling method. They extend approximately to the harbor line on either side of the river. Section 3, the river section, was constructed by the trench and tremie method, using previously constructed tube sections sunk in a previously prepared trench in the bottom of the river.

Sections 1 and 5 offered few departures from standard engineering practice. The shield excavations were notable only because of the unusual size of the shield, the largest constructed in this country. The river section, on the other hand, offered several new and distinctive departures from any of the previous methods of construction.

The River Section

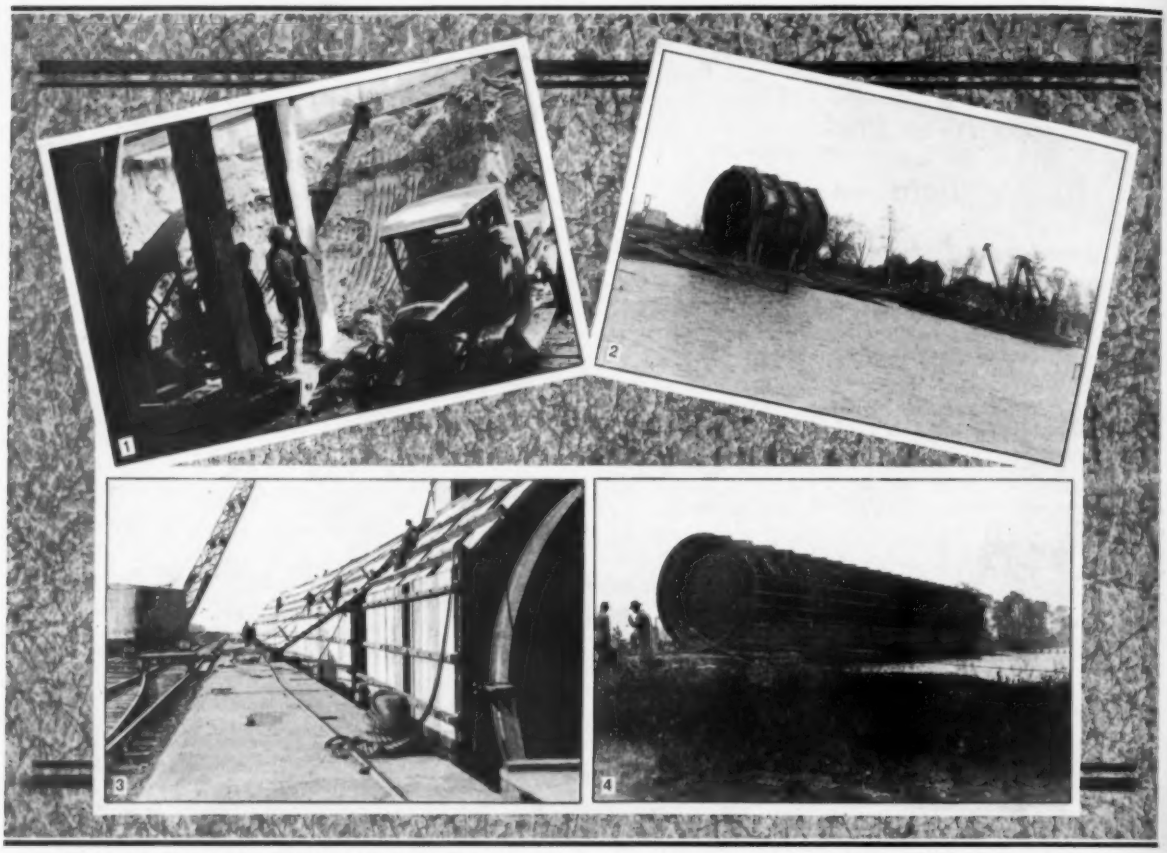
The river section consists of nine steel tubes with an inside diameter of 31 feet, outside diameter of 35 feet and a length ranging from 220 to 250 feet. These tubes were fabricated at Ojibway, Ontario, at the plant of the Canadian Steel Corp. They are constructed of ⅜-inch steel plates, reinforced on the outside by octagonal-shaped diaphragms of 5/16-inch plates and angles. The diaphragms serve a double purpose, that of stiffening the shell and providing fastenings for the exterior concrete forms. They are spaced 12 feet apart. Circumferential angles, placed on 4-foot centers, further reinforce the tube on the inside. The longitudinal seams between the various plates are electrically butt-welded, there being more than 12 miles of welding on the whole job. Seams between the plates were riveted and, instead of the usual method of caulking for water tightness, had a bead of metal run in at that junction by the electric welding process, thus insuring an absolutely waterproof tube.

Each tube, prior to launching, was sealed against hydro-static pressure by the installation of temporary bulkheads, constructed of 10 x 10 timbers supported by heavy steel trusses. The outer faces of these bulkheads were waterproofed with eight plies of membrane waterproofing, protected by an outer layer of heavy canvas.

The tubes were erected on launching ways and, following completion of the temporary bulkheads, were launched into the Detroit River and towed to a nearby slip where the interior lining of 18 inches of reinforced concrete and the roadway slabs were placed. This interior lining of concrete was placed through holes in the steel shell which afterwards were covered with steel plates and welded into place. Sectional steel forms were used and the concrete chuted directly into the forms through flexible chutes.

Tubes Covered With Concrete

A portion of the exterior covering of concrete also was placed while the tube was still in the slip. This portion known as the "keel," is 2 feet in thickness and extends across the base of the tube and up part way on the side. This additional weight tended to lower the center of gravity of the tube and increase stability during the towing. Each tube, when launched, drew about 7 feet of water. When ready for towing, each tube drew about 23 feet of water. More exterior concrete would have been placed at Ojibway except for the fact that



EXCAVATION AND PREPARATION OF TUNNEL SECTIONS FOR THE DETROIT-WINDSOR TUNNEL
1. Bay City ¼-yard shovel working on land section 5-B. 2. The Ojibway, Ontario, plant, during the erection of the first tube in October, 1928. 3. A tunnel tube at Ojibway where nine steel tubes comprising the river section were fabricated. 4. Launching a tube at Ojibway

this operation was limited by the available depth of water.

PLACING THE TUBES

From Ojibway the tubes were brought upstream about 6 miles to a mooring place off Detroit. This mooring place consisted of five large clusters of piles, driven parallel to the direction of the current and about 800 feet from the Detroit harbor line. Here each tube was moored while being prepared for the final sinking operation. Four tugs were employed bringing the tubes upstream, the average towing requiring about three and one-half hours.

While moored to the pile clusters, additional concrete was applied to each tube until it reached a point of submergence. Two buoyancy scows, one at each end, were drawn over the partially submerged tube, cables were run down from hoisting engines mounted on each scow and attached to the tube. Scows and tubes then were maneuvered into position and the tube gently lowered into its river-bottom resting place. Departing from the usual procedure in such an operation, no water or other ballast was admitted to the tube during the sinking. So carefully had the weight of steel and concrete been calculated that 50 tons of concrete blocks were all that was required to give the added weight necessary in the sinking operation. Thus the actual weight handled by the buoyancy scows was very little in excess of 50 tons, although the tube itself in this condition would weigh approximately 7,500 tons in the air. All of the tubes were laid in a previously prepared trench dredged across the river as nearly as possible to the required grade of the tube. This necessitated a trench with an approximate width at the bottom of 20 feet in a depth of water varying from 65 to 83 feet. The clay bed of the Detroit River is very stiff and stands at better than a one to one slope. Just previous to sinking the tubes, a bed of sand and gravel was placed in the bottom of the trench and brought to the exact grade by the use of a specially-designed levelling device consisting of a pontooned raft from which a steel grillage was suspended. This contrivance was anchored directly over the trench and the grillage dragged backward and forward to rake the sand and gravel fill to its proper grade and elevation. So successful was this device that the sand and gravel were placed to within 1 inch of correct grade and elevation.

In order that the location of each tube could be controlled while it was under water, steel alignment masts were mounted at each end. Exact alignment and grade thus could be ascertained from instruments set up on shore, much as a hunter would aim a rifle. So perfect was the engineers' aim that the nine tubes were projected across the river for a distance of almost half a mile with an error of only a few inches.

Each tube, as sunk, was connected to the preceding

operation by means of heavy pins put in place by divers. Joints were sealed on the inside by the concrete lining, although provision also was made for attaching forms to the diaphragms and pouring tremie concrete around the joints on the outside. After the tubes were concreted and the tremie concrete joints poured, the trench was backfilled with clay excavated from the trench with a minimum fill of 4 feet over the tubes. Completion of the interior of the tube was accomplished by entering the tubes from the land end, through the shield-driven section, and removing the bulkheads as the workmen progressed outward from the harbor line.

SHIELD-DRIVEN SECTIONS

The river section comprises about half of the tunnel, with the rest taken over by the shield-driven sections and the approaches. The shield was 32 feet, 3½ inches in diameter and made from 10 to 20 feet of progress each twenty-four hours of operation. An elaborate ventilation system, capable of pumping 1,500,000 cubic feet of fresh air a minute into the tunnel interior, has been installed. The roadway is made up of 2,000,000 granite blocks, 4 inches square. Six hundred powerful yet diffused lights make the roadway almost as bright as day, a condition greatly aided by the brilliant white-tiled walls. A fine, wide boulevard is the result, binding together forever the downtown districts of two cities in two nations.

PERSONNEL

Engineers on the tunnel are Parsons, Klapp, Brinckerhoff & Douglas, of New York. Colonel Burnside R. Value is Executive Engineer; S. A. Thoreson, Engineer of Design, and Vincent Macaluso, Field Engineer.

Among the larger contractors and subcontractors are the Parklap Construction Corp., with Frank W. Barnes, Vice President, in charge; Porter Brothers and Robert Porter, Northern Construction Corp., J. W. Stewart & Welch, M. Sullivan Dredging Co., Spencer, White & Prentis Co. and the Mark R. Hanna Co.

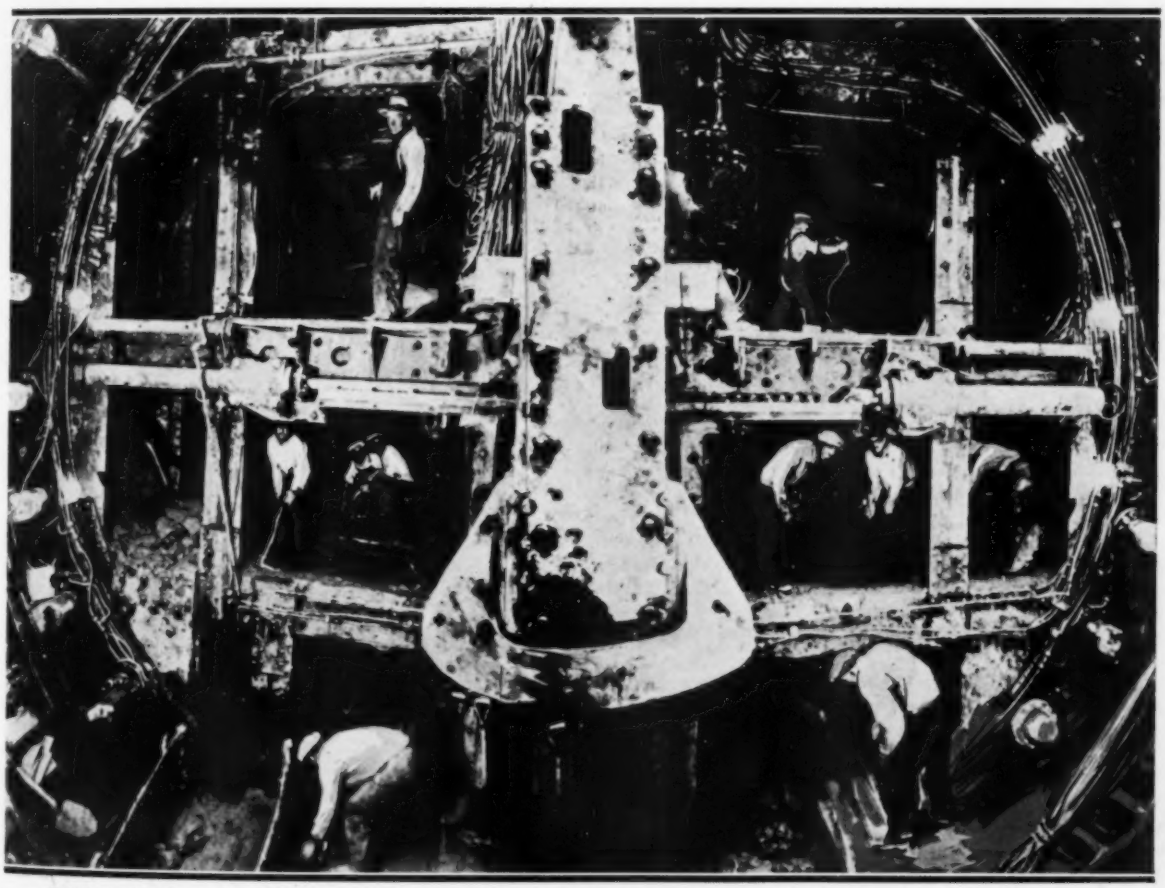
Lassiter Licks the Subgrade

(*Continued from page 74*)

small asphalt kettle, poured the hot asphalt and spread it alone. The average run of base per day was 1,218 feet, 3 inches deep and 18 feet wide. The top was laid at the rate of about 1,600 feet per day, the full width and 2 inches thick.

PERSONNEL

The work on this 7.1-mile sand asphalt project was in charge of N. S. Heddrick, Superintendent for Robert G. Lassiter & Co., Raleigh, N. C. W. F. Morgan is District Engineer and W. C. Cooper was Resident Engineer for the State Highway Commission.



THE SHIELD, LARGEST IN NORTH AMERICA, USED ON THE DETROIT AND CANADA TUNNEL
About 1,700 feet of tunnel were excavated in two shield-driven sections, one at each end of the tunnel. This is a composite photograph made up of four separate shots

The New Research Laboratory of the U. S. Pipe & Foundry Co. at Burlington, N. J.

U. S. Pipe and Foundry Company Opens Research Laboratory

ON October 22 a group of trade paper editors and several engineers from foreign countries were the guests of the U. S. Pipe & Foundry Co., at Burlington, N. J. A very thorough inspection was made of the new Research Laboratory which this company has recently established to study casting problems and methods of remedying them. When a new line of research is developed it is to be tested in the laboratory and if found feasible, then will be tried on a small commercial scale in the experimental plant and if there found successful, will be placed in production in the large foundries at Burlington.

The laboratory is a 3-story wing built adjacent to the general offices and in the same style. The laboratory may be entered from the general offices or from the roadway which runs in front of the building. On the first floor is the entrance lobby with interesting exhibits including an old cast iron pipe cast on the side showing varying thickness of the walls, two cutaway sections of Anthony joint for gas pipe, sections of bitumastic and cement lined pipe and DeLavaud pipes machined down to a very thin section to show the character of the metal. In addition there is a model of a sugar house which was exhibited by this company at the Sesqui-Centennial Exposition at Philadelphia. Back of the entrance lobby is the physical laboratory which is completely equipped for the physical testing of metals. A large Hoskins electric heat treating furnace with automatically controlled heat and also a smaller electric furnace for other specimens, Olsen automatic pressure Brinnell apparatus, a new Olsen cement tester, a Rockwell hardness tester, an Olsen impact testing machine, a ring impact tester developed by the physicists of the company, and an Amsler hydrostatic testing machine capable of testing metals either in compression or tension, are among the larger pieces of equipment in this laboratory. A Disston power hack-saw for preparing sections and rings, and a disc grinder lathe and drill press for other work are also included.

On the second floor is the library and offices, while on the third floor is the chemical laboratory and the photographic and grinding room as well as the cement laboratory. The cement laboratory is equipped for drying and automatically recording the per cent moisture of sand, it also has a machine for testing cores either green or dried, a porosity tester and the usual moulds for preparing cement specimens for cement briquettes for testing. The photographic room has an apparatus for photographing polished specimens of metal under great magnification. This Leitz-Wetzler photographic apparatus will take pictures of anything from a sand grain to a section of 8 or 10-inch pipe. A special grinder room for preparing specimens for the photo-micrographs and dark room are also provided.

The chemical laboratory is complete with gas, water, and air piping and electric current, all of the metal being chromium plated to prevent corrosion. Numerous other special pieces of apparatus, such as the high speed electrolytic cabinet in which a gram of metal can be deposited electrolytically in a few minutes complete the equipment.

On the roof sections of pipe and metal are exposed for corrosion tests and in a swampy field nearby specimens are secured for soil corrosion tests. In the basement, at present, there is a special machine set up to determine the resistance of various pipe linings to leaching. Sections of pipe are set up with the various linings and filled with distilled water which is churned constantly by plungers and samples of the water taken each week for analysis.

This laboratory which has 15 employees and research assistants is in direct charge of Dr. F. C. Langenberg and represents a large investment in the structure and equipment.

Structural Metal Painting

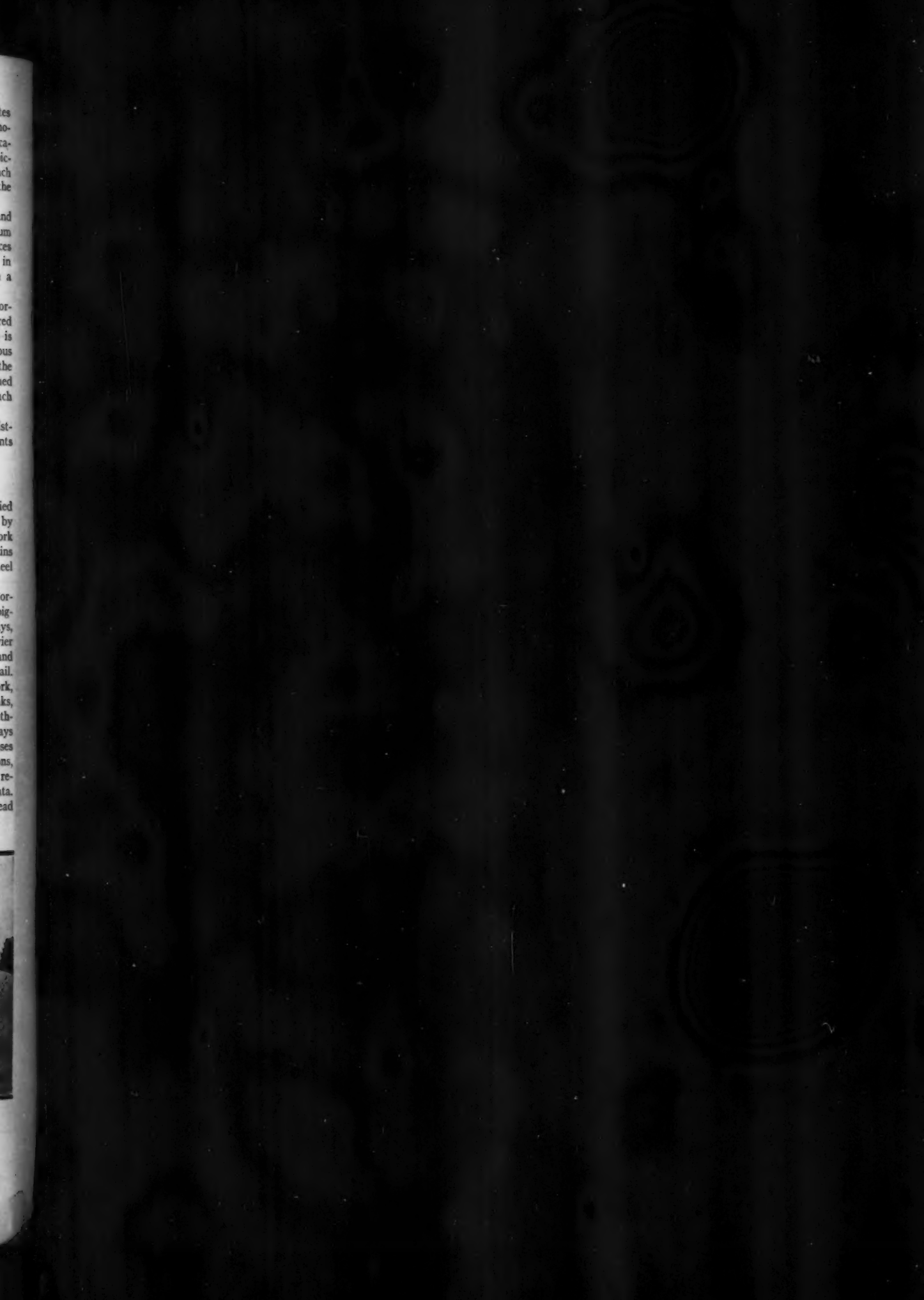
AN 82-page booklet made so that it can be easily carried in the vest pocket, has recently been published by the National Lead Co., 111 Broadway, New York City. This booklet by A. H. Sabin, M. S., D. Sc., contains a wealth of information on the painting of structural steel in buildings, bridges and other work.

The various topics discussed in detail are theories of corrosion, technical considerations, such as the wetting of pigments, the index of refraction, the effect of ultra-violet rays, chalking, settling of pigment and the trend toward heavier paints. A number of formulae are given for pigments and oils and the various types of leads are described in detail. Another chapter is devoted to various types of paint work, including a black finishing coat, highway bridges, water tanks, ships, underground pipes, viaducts and galvanized iron. Methods of estimating areas and costs are given and the ways of cleaning metal surfaces are described. The booklet closes with chapters on mixing red lead paint, painting specifications, formulae, the specific gravity of pigments and weight required to make a gallon and a handy table of red lead data.

The booklet may be secured free from any National Lead Co. office.

OUT OF REACH OF THE CRANE BUT NOT OF THE TRACTOR

The Henkel Construction Co. at Stanford, Ill., found that the crane could not pick up this gravel so it put an Allis-Chalmers Monarch 50 to work and the gravel was soon whisked within the grasp of the grab.



A Section of
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AND
ENGINEERS MONTHLY
Devoted to
News of Consultants
in the
Civil Engineering Field

The Consulting Engineer

November, 1930
New York
Vol. II, No. 5

Wide Variety of Engineering Projects Under Way

Office of Burns & McDonnell Engineering Company, Kansas City, Mo.

THIS organization has just completed a three months' engagement in making an appraisal, for the City of Amarillo, of the light and power property of the Southwestern Public Service Co., the appraisal to be used as a basis for rate regulation or municipal ownership.

Cincinnati, Ohio, has engaged BURNS & MCDONNELL ENGINEERING CO., Kansas City, Mo., and Los Angeles, Calif., to make estimates and a report on a 10-year program of water improvement as well as an appraisal of the entire water works property and a further report upon a revision of the water rates to be based on the value of the property.

Water works improvements carried out under the plans and specifications of this company have just been completed at Bartlesville, Okla. The improvements cover a new elevated reservoir of 300,000-gallon capacity, extensions to the distribution system and feeder mains.

South Bend, Ind., has engaged Burns & McDonnell for the designing of an intercepting sewer that will receive the sewage of 44 outlets now discharging into the river, and for the designing of a complete sewage treatment plant at an estimated cost of $6,000,000 for the entire project. Plans have been finished and contracts let for the enlargement of the filtration plant and clear water reservoir at Clarinda, Iowa.

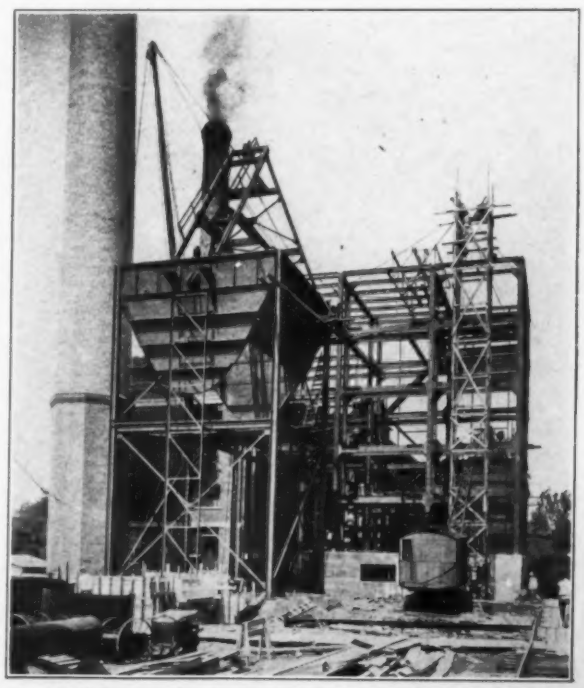
Kansas City, Kans., has let contracts to the amount of $1,250,000 for improving its water works and light plant. The plans of Burns & McDonnell Engineering Co., contemplate a $5,000,000 further extension and enlargement of the combined water and lighting plant. Investigation has just been completed of the water rates of Freeport, Ill., based upon the price valuation of property.

Construction work is just being completed and the filtration plant and water softening installation placed in service on September 15 in Iola, Kans. This installation is a combined water softening filtration and recarbonation plant using the Neosho River as a source of supply.

Paducah, Ky., has just had completed an itemized appraisal of its entire water works property. This appraisal is to be used as a basis for the purchase of the property which is permitted under the water company's franchise.

Springfield, Ill., voted $2,500,000 for the construction of Lake Springfield as an auxiliary source of supply

(Continued on page 82)



An Addition to the Boiler Plant of the Municipal Water, Light and Power Department, Springfield, Ill.

The Consulting Engineer

A Section of

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Various Activities of Chicago Engineer

THE practice of JOHN N. OSTROM, Room 1218 Engineering Bldg., 205 Wacker Drive, Chicago, Ill., consists of reports on the condition of bridges and other framed structures, based on personal physical examination. For the past 17 years he has prepared the annual Big Bridge Reports for the Chicago, Burlington & Quincy Railroad Co., as Consulting Bridge Engineer.

A manual describing the methods followed in the examination of old structures, based on a continuous practice of 53 years, is now being prepared by Mr. Ostrom. An article entitled "Five Decades of Bridge Evolution 1840 to 1890" will appear in an early issue of the *Cornell Civil Engineer*. Another article which was published recently in the same magazine entitled "Accurate Shop Measurements of Structural Details" outlines the various phases and requirements of accurate structural inspection.

Consulting Briefs

Gilbert C. White Co., Durham, N. C., and Richmond, Va., has made reports covering needed additions and improvements to the water supplies of North Wilkesboro, N. C. and Clifton Forge, Va.

H. L. Thackwell, Consulting Engineer, City Hall, Jacksonville, Texas, is preparing among other work plans for a paving project in Rusk, Texas; a sewage disposal plant of the activated sludge type for Rusk, Texas; and a sewage plant for Longview, Texas.

Hood, Decker, Shoecraft & Drury, Ann Arbor, Mich., are preparing reports for water supply for Fort Wayne, Ind., and for sewage disposal for Birmingham, Mich.; plans for water works and sewage disposal for Flint, Mich.; for a sewerage system for Traverse City, Mich., and a drainage system for Dickinson County, Mich. This company is also supervising the construction of water mains for Eaton Rapids, Mich.; a 6-mgd filtration plant and pumping station at Grosse Pointe Farms, Mich.; a water plant and mains for Rogers City, Mich., and water works, sewerage and sewage disposal for Clio, Mich.

Arthur Leland, Recreation Consultant and Landscape Architect, City Hall Building, Newport, R. I., recently completed plans for a playground and park, Glens Falls, N. Y.; Home School campus, State Welfare Commission, R. I.; and the campus, Portsmouth Priory School. Construction of the above projects and also of the playgrund and tennis courts, Dedham, Mass., is being carried on under Mr. Leland's supervision. James Brown and Arthur J. Oler recently joined the staff.

W. E. Moore & Co., Pittsburgh, Pa., reports that H. G. Peterson, Architectural Designer, has recently been added to the staff. A new four-story machine shop and foundry building for the Pittsburgh 'Leetromelt Furnace Corp. is being built under the supervision of this company. The building, which will be equipped with a 25-ton crane, will have a steel frame, brick and glass enclosed and have a floor area of approximately 90,000 square feet. It will cost about half a million dollars.

Charles Edgar, Jr., of **Carter, Edgar & Wittwer, Inc.**, 728 Cooper St., Camden, N. J., reports that several projects are now under construction from this organization's designs and under its supervision. These include 2 miles of reinforced concrete road, in Gibbstown, N. J., 2 miles of gravel road at Thorofare, N. J., and a complete water system consisting of artesian wells, a pumping station, and storage tank in the Borough of Paulsboro, N. J.

Charles Foster, 512 Sellwood Building, Duluth, Minn., is supervising the construction and installation of mechanical and electrical equipment for an addition to the school building at Coleraine, Minn., and additional equipment for the sewage treatment plant at Fairmont, Minn.

Walter J. Lehner, Ullrich Bank Bldg., Mt. Clemens, Mich., was an expert witness in a recent drainage case involving the Macomb County Drainage Commissioner and Treasurer.

Hall & Withington, Centerville, Ia., are superintending the construction of several works from their plans including a sewage disposal plant at Melcher, Ia.; street paving at College Springs, Ia.; road graveling at Moravia, Ia.; and a drainage project in Decatur County, Ia.

Material Testing on Large Structures

DURING the extensive addition and alterations made by the Northern Trust to their bank on the northwest corner of Monroe and La Salle St., Chicago, a new security vault was installed in the sub-basement of the building. ROBERT W. HUNT CO., 2200 Insurance Exchange, Chicago, Ill., acted as consulting engineers on this vault, tested the material, made inspection during the fabrication and supervised the installation at the bank.

C. B. Nolte
President

All vaults now in use are constructed with heavy reinforced concrete walls and steel linings. The problem of extending this type of construction to the new vault was not simple as the space was limited. The steel lining erected inside the concrete wall is 3 inches thick, laid up of burn-resisting cast plates, 5-ply chrome steel drill-proofed plates and open-hearth steel, and all fastened together with 7-ply drill proof screws. The doors, a rectangular entrance door and round emergency door, are 24 inches thick, laid up of burn-resisting material, drill-proof 5-ply chrome steel and cast and open-hearth steel. The locking devices are controlled by a 4-movement timer on the main door and a 3-movement on the emergency door. All equipment was furnished by the Mosler Safe Co., of Hamilton, Ohio, and plans and specifications were prepared by C. S. Frost and C. C. Henderson, Architects, who also superintended the reconstruction.

Charles C. Whittier
Consulting Engineer

The Robert W. Hunt Co. also tested and inspected the structural materials used in the construction of the Merchandise Mart in Chicago, including 52,000 tons of structural steel, 5,000 tons of reinforcing steel and 300,000 barrels of cement.

Another large inspection job covered by this company was on the new $12,000,000 double-track bridge of the Southern Pacific Co. over Suisun Bay between Port Costa and Benecia, Calif., including all the steel for the piers, all steel and machinery for the superstructure at the mills, foundries and fabricating shop, and making a special inspection of the I-bars during all stages of manufacture and proof-testing after heat treatment. This project was described in the July, 1930, issue of CONTRACTORS AND ENGINEERS MONTHLY.

The Engineering Department of the Robert W. Hunt Co. has recently completed work in connection with the investigation to determine the condition of structural steel that had been in place from 30 to 37 years in the elevated railroad structure in Chicago, as well as comprehensive tests and determinations on steel floor framing encased in concrete for the purpose of obtaining information to be used in the revision of building codes. These tests were the subject of a very elaborate report issued in the June *Proceedings* of the Western Society of Engineers.

Papers recently read by members of this organization include "Acid and Corrosion Resistant Alloys," by C. E. Plummer, Technical Director of the Chemical and Metallurgical Department; "Why Do Intermediate Manganese Steel Rails Fail?" by H. H. Morgan and J. R. Mooney of the Rail Inspection Department; "Present State of Cylinder Testing," by F. Eder, one of the engineers of the New York organization of this company; and a paper on soil pressure and foundation engineering, by C. C. Whittier, of the Chicago Engineering Department. Mr. Whittier has also presented a paper on "Civilization and the Mineral Industry" before a meeting of the Illinois Geological Survey at Urbana, Ill.

Dr. Waddell Receives First Award of the Clausen Medal

IN January, 1930, the American Association of Engineers announced that it would award annually the Clausen Gold Medal to the citizen of the United States who, during the preceding year, performed the most distinguished services for the welfare of engineering, either social, economic, or both. A Committee of Award of ten distinguished engineers and scientists was appointed and publicly invited the cooperation of engineers and others in the nomination of eligible candidates. The award was recently made to DR. J. A. L. WADDELL, Consulting Engineer, New York.

John Alexander Low Waddell graduated from the Rensselaer Polytechnic Institute in 1875, served successively as assistant engineer on the Canadian Pacific Railway, and on the Glasgow Bridge across the Missouri River, was Chief Engineer of a bridge construction firm, four years head of Civil Engineering in the Imperial University at Tokyo, Japan, and a contracting bridge engineer in Kansas City.

Since 1892 he has practiced as a Consulting Engineer including engagements with the North Western, and Union Loop elevated railroads, Chicago; as Chief Engineer, Pacific Short Lines; Chief Engineer, Omaha Bridge and Terminal Railway; Chief Engineer, Trans-Alaska-Siberian Railroad; Consulting Engineer, Boston Elevated Railroad; Consulting Engineer, Port of New York Authority; Consulting Engineer, Chinese Government; and consulting engineer for many other important works.

Dr. Waddell was a member of the International High Commission on the Yellow River Bridge, China. For several years he has been chairman of the American Association of Engineers' Committee on Engineering Education. He is a member of the American Society of Civil Engineers; of the American Association of Engineers; Honorary Member of the National Engineering Societies of Spain, China, and Peru and a member of twenty or more other engineering societies.

He has three times received the award of the Norman Medal, the highest honor in the gift of the American Society of Civil Engineers, and has written six technical books of great value which are widely recognized as authoritative for advanced bridge design and construction.

Report on Abatement of River Pollution

Office of Remington, Vosbury & Goff, Engineers, Camden, N. J.

THIS well-known firm of consultants has made a very complete report to the Port Raritan District Commission on "Methods for Abatement of the Pollution of the Raritan River." This has entailed a comprehensive field study, a study of the population growth of the various cities and towns in the area, the flow of the river and the amount of pollution.

The Raritan River drains an area of 1,105 square miles, and with the exception of the Delaware, is the largest river in New Jersey. The average yearly discharge at Bound Brook, N. J., for the period of 1922-1928 was 832,000,000 gallons per day and is fairly representative of the normal yearly mean flow. The mean flow for the summer months of the above period was 529,000,000 gallons per day, although for one exceptional part of that time, that is, for 1923-1925, it was as low as 322,000,000 gallons per day.

There is now being discharged each day in the Raritan River about 35,000,000 gallons of sewage and industrial wastes. It has been estimated that the solids in this sewage amount to approximately 50,000 tons per year, of which about one-half is mineral matter and harmless. The remaining half is organic matter and is the cause of the existing pollution of the organic solids. From 4 to 5,000 tons settle out each year to form the slimy, bubbling sludge banks, which at frequent intervals may be seen along the shores.

The industrial wastes can be considered as equivalent to the sewage discharged from a community of not less than 50,000 people. While this figure is approximate and undoubtedly low, it indicates these wastes to be an important factor in the pollution of the Raritan River.

The 1930 population of the drainage area along the lower Raritan is 190,000 and a careful check upon the past growth in this territory indicates that by 1940 the population will be at least 239,000 and that 15 years later, in 1955, it will equal or exceed 305,000.

The problem involves the restoration of the river to such a condition that it will cease to be a danger and a menace to public health; rendering the waters of the river safe for bathing, boating and out-of-door recreation and in such condition as will allow the return and propagation of fish and other aquatic life; maintaining the river in a clean and sanitary condition and thus aiding in the development of parks and drives along the shores and in making the Raritan Valley desirable for the building of homes and the location of industries; employing some means for the collection of domestic and industrial wastes.

After an exhaustive study of the advantages of a trunk sewer to discharge into the Raritan Bay or into the ocean beyond or a system of separate sewage treatment plants, some of which would treat the sewage of a single community and others serve two or more communities, the following recommendations were made by the engineers:

1. Construction of a trunk sewer be postponed until required by an increase in the population to be served.
2. Communities construct individual or jointly operated treatment plants with necessary works for the collection of sewage to be retained and used as part of the trunk sewerage system when built.
3. Each sewage disposal plant be built to conform, insofar as circumstances will permit, to the degree of treatment and general plan described in the report.
4. Industrial wastes be treated at municipal plants when economically possible, or in separate plants, to be constructed by the industry concerned.
5. The several communities and industries shall cooperate in the construction of disposal plants as soon as possible and thereby abate the existing pollution of the Raritan River within a reasonable period of time.

Wide Variety of Engineering Projects

(*Continued from page 79*)

supplementing the Sangamon River. The improvements will involve the construction of a large dam and the creation of a lake 6 miles long, which will be used both for domestic water supply and recreation purposes.

Burns & McDonnell Engineering Co., has been authorized by Lawton, Okla., to complete all the final plans and specifications for the new 12,000,000-gallon filtration plant, reservoirs, pipe lines, and other improvements for which $6,000,000 in bonds have been sold.

Augusta, Ga., has asked this company to make a survey and report upon improving the municipal canal system, power plant, and other improvements involving the expenditure of about $2,000,000. The municipal canal system is the oldest municipal canal undertaking in the United States, being originally installed in 1893.

Williston, N. D., has asked Burns & McDonnell to prepare plans and specifications for enlarging its filtration plant and the construction of a new clear water reservoir as well as other improvements.

H. F. McElroy, City Manager, Kansas City, Mo., has employed this company to make a water rate survey and an investigation covering a complete revision of the water rates, based on the operation of the new filtration plant and present-day costs of operation.

As indicative of the further developments in construction projects in the water works line, Burns & McDonnell Engineering Co. reports plans under way for a total of 34 different water, sewer and lighting installations extending over 17 states. The total estimated cost of the projects for which plans are now under way is $38,000,000.

The illustration on page 79 shows an addition to the boiler plant of the Municipal Water, Light, and Power Department, Springfield, Ill. This project includes a new building to house the boiler on which the steel work has just been completed. A new coal handling system having a capacity of 60 tons per hour with a skip hoist, and a 300-ton capacity elevated bunker, which is partly erected, is shown in the left foreground. A new boiler of 7,590 square feet of heating surface is being installed, complete with stokers, mechanical draft equipment, economizer and air preheater. The total cost of the project will be about $225,000.

The Editor Comments —

A Highways League of Nations

From October 6 to 10, prominent highway officials representing 63 countries gathered in Washington, D. C., at the Sixth Congress of the Permanent International Association of Road Congresses. These 1,000 delegates discussed the major problems of concrete and bituminous road construction and arrived at definite conclusions satisfactory to the various delegations representing the different countries.

"A Highways League of Nations" is truly applicable to this gathering as not only were engineers whose work is carried on under widely varied conditions gathered to discuss the fundamentals of road construction, but in order that they might converse and discuss these problems with the minimum loss of time, four official languages were adopted and the League of Nations system of reporting was used. English, French, German, and Spanish were the four official languages. Inasmuch as the general reporters were all engineers from the United States the use of English predominated, but each paper or report as read was translated simultaneously with its reading into French, German, and Spanish by interpretors seated at the front of the auditorium close to the speaker. Each interpretor had a head phone connected with the microphone of the speaker and with the speaker enunciating clearly and speaking slowly, the interpretors immediately translated the discussion into the foreign languages which were transmitted from their microphones to head phones used by their compatriots in different sections of the hall.

When a foreign delegate, for example a Frenchman, spoke, the French interpreter translated his discussion into English, and all of the English-speaking delegates immediately donned their head phones and received the discussion in their native tongue.

It was particularly interesting to note that a large proportion of the foreign delegates spoke more than one language, and usually included English as a tongue with which they were familiar. Thus it was not difficult for an English-speaking delegate to converse outside of the regular session with a large proportion of the delegates from other countries. It was my privilege during the session to discuss road problems with delegates from seventeen different foreign countries.

Foreign Delegates Intensely Interested in American Road Machinery

An exposition of American road machinery was held at the Washington Auditorium during the progress of the Congress. While this exposition was not as large as the Annual Road Show of the American Road Builders Association, it was representative of American road building machinery, and included not only exhibits in the auditorium but also outdoor exhibits and a demonstration of machinery in action.

Groups of foreign delegates literally haunted these exhibits, inquiring for information on the specific machines or materials they examined and went away loaded with literature from each booth. An intense interest was also displayed in CONTRACTORS AND ENGINEERS MONTHLY on the part of the foreign delegates, as they were particularly pleased with its practical character from the construction standpoint. A few delegates commented most favorably on the remarkable aggregation of reports from more than 50 countries which appeared as the opening article of the October issue under the title "Road Building Around the World."

Road Congress Most Beneficial

There is no doubt but what this Sixth Congress of the Permanent Association of Road Congresses has come at a time when American road construction is at its prime, and American methods will have a great influence on the large group of foreign engineers who have been here. Our guests from across the seas, both east and west, were intensely interested in both design and construction, and many of them took advantage of their early arrival to inspect construction in Canada and in the United States, and those arriving on our western shores had ample opportunity to see construction under way in California and other Pacific Coast states before starting on their transcontinental journey.

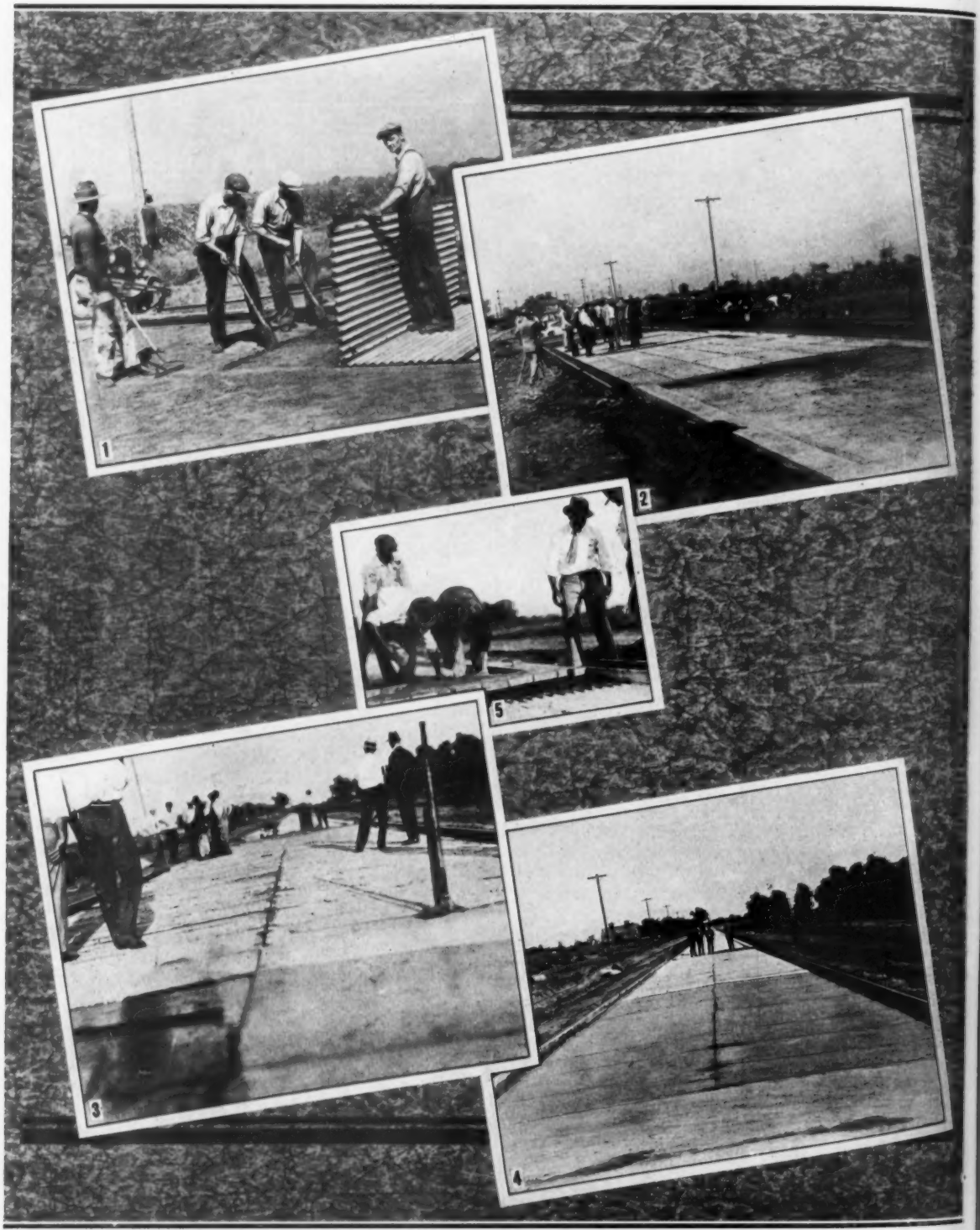
The advantage of the large number of American machines over foreign competitors was shown most conclusively, and should result in increased export of equipment developed by American ingenuity as compared with the foreign trade of the last few years.

It will be many years before the United States of America will be privileged again to welcome so large a body of engineers engaged in design and construction of highways, as the International Congress does not meet annually, and there are many countries in Europe and South America who will gladly welcome the Congress to its doors before we shall be permitted to again be host. It has been a genuine privilege to the highway engineers of the United States to have as their guests such a brilliant group of road builders, and it is hoped that from time to time these engineers and contractors will return to our shores as individuals and know the individual hospitality of our states and road builders.

If any of our readers in foreign countries, and the number has increased considerably because of the recent Road Congress, are expecting to visit the United States, all of the facilities of CONTRACTORS AND ENGINEERS MONTHLY will be gladly placed at their disposal to help them see the best work in the various fields of construction during their visit to these shores.

Theodore Reed Kendall

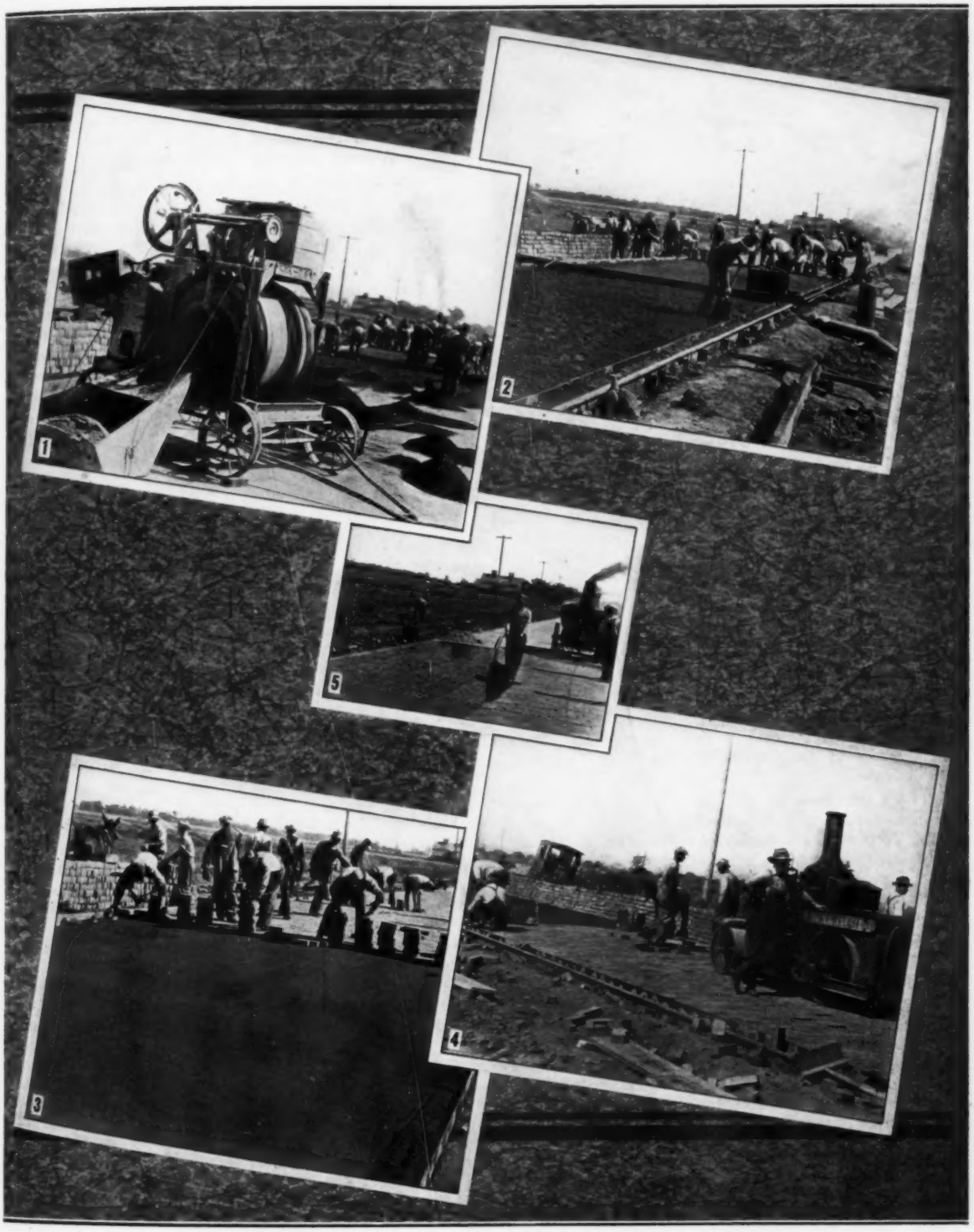
Progress Photographs of a New Road



BUILDING THE FIRST METAL BASE HIGHWAY, SPRINGFIELD, ILL.

1. *Digging narrow trenches for the transverse edge of the metal base which was turned down to grip the roadway.* 2. *The first and second sections in which the corrugations run parallel to the center line of the roadway.* 3. *A close-up of the completed base sections.* 4. *A view of the* 150-*foot iron base and curb.* 5. *A close-up of the mastic sand cushion and brick wearing surface laid on the corrugated sheets. Cooperating in this test are the National Paving Brick Mfrs. Assn., the Poston-Springfield Brick Co., and the American Rolling Mill Co.*

With an Experimental Metal Base



LAYING THE BRICK SURFACE OF THE NEW METAL BASE HIGHWAY

1. The mixer in which the mastic cushion was prepared for spreading on the metal base and in which the bricks were imbedded. 2. Spreading and rolling the mastic cushion in the foreground and laying brick in the background. 3. The brick laying organization. Bricks were handled in clips instead of by roller conveyor as is so common in this type of work. 4. Rolling the newly laid bricks to set them firmly in the mastic, using a tandem steam roller. 5. Flushing the rolled brick with the asphalt filler

Digging Broken Concrete, Clay and Old Pipe on the New 6-Mile Sewer Through the Heart of Chicago

Laying Six Miles of Sewer Through the Heart of a Large City

ON August 14, 1930, ground was broken at Monroe and Clinton Streets, Chicago, for the construction of a 6-mile sewer to cost about $2,000,000. This job, let by the Chicago Board of Local Improvements to the Underground Construction Co., is a main sewer for the near west side of Chicago. While a 6-mile sewer need not necessarily be a huge undertaking, it really is a big job to build it through a main street in the most congested section of the second largest city in the country. The excavation for the main section of the sewer is 18 feet deep by 16 feet wide.

The first 1½ miles are being built of concrete and the balance of common sewer brick, 3 and 2 ring construction. The sewer itself being 17 by 15 feet and reducing finally to 4 feet in diameter.

Although the excavating is mostly through clay, it is first necessary for the Link-Belt trench hoe to remove a pre-broken paving. There are also a number of old pipes and miscellaneous fill-in material which must be sorted from the clay and placed to one side. With the removal of 150,000 yards of excavating ahead of them, J. J. Casey, President and W. J. McGraw, Superintendent for the Underground Construction Co., have been pleased with the speed of the digging which was about 10 to 13 feet an hour of earth at 9 cubic yards to the foot, or about 117 cubic yards per hour.

The loading of 5-ton trucks required an average of 3 minutes per load, according to the Superintendent for John M. Bransfield Co., subcontractor on hauling.

When this job is completed in December, 1931, Chicago's West Side will have a long needed sewer, connecting with the present sewer under the Union Station, which empties into the Chicago River at Washington Street.

The story of a combined state highway and private water company pipe line job handled in parallel by a single contractor is told in "Road and Pipe Line Jobs in Parallel," to appear in the December issue of CONTRACTORS AND ENGINEERS MONTHLY. *A 42-inch cast iron pipe line was laid largely in rock trench alongside the new highway, necessitating great care in blasting.*

Work of a Dixie Contractor in Pennsylvania

(*Continued from page 67*)

The shoulders were finished with mules and scrapers and then spread with a road machine and tractor. Where hand work was necessary a crew was sent back for that purpose.

All headwalls for the culverts were poured after the concrete had been completed and was open to light traffic. A small mixer was sent back for this purpose. The contractor feels that the pouring of the slab is a wholesale proposition, while the pouring of headwalls is distinctly a retail matter. If the paver were stopped to place a batch in a headwall a large organization would be held up without any decrease in overhead. The contractor would have to penalize himself on cement, as the concrete for the headwalls is not as rich as the slab, and then, lastly, when the road is open it is easy to pull a small mixer along to the various sites and the aggregate can be placed on the road slab without loss. In addition the line and grade of the road slab gives the men a definite base for measurements to locate the height of the headwall.

PERSONNEL

The contractor for these three projects was the Hagedorn Construction Co., Brookville, Pa., H. Hagedorn, President. Prior to three years ago the headquarters of the organization was in Greensboro, N. C., which accounts for many of the typical southern methods employed in their work. W. R. Ross was General Superintendent for the company.

On Sections 1 and 2, Route 237, O. H. Rickenbrode was Chief Inspector, and on Route 63 M. R. Skinner was Chief Inspector for the State Department of Highways. All three contracts were executed under the supervision of S. W. Jackson, Division Engineer of the Pennsylvania Department of Highways, with headquarters at Clearfield, Penna.

Allocation of Federal Aid Funds Advanced to September 1

THE work of the state highway departments has been accomplished with such satisfactory speed during 1930, that the U. S. Bureau of Public Roads advanced the allocation of federal aid funds amounting to $121,875,000 to September 1, instead of in December, the usual time of allocation.

The apportionment of federal aid by the Secretary of Agriculture from the appropriation authorized for the fiscal year 1932 which became effective September 1, 1930, is as follows:

State	Sum apportioned	State	Sum apportioned
Alabama	$2,615,434	Nebraska	$2,644,726
Arizona	1,768,023	Nevada	1,598,987
Arkansas	2,174,786	New Hampshire	609,375
California	4,181,212	New Jersey	1,565,749
Colorado	2,315,948	New Mexico	1,984,363
Connecticut	792,359	New York	6,002,473
Delaware	609,375	North Carolina	2,871,732
Florida	1,543,232	North Dakota	2,001,841
Georgia	3,316,029	Ohio	4,584,440
Hawaii	609,375	Oklahoma	2,922,569
Idaho	1,554,594	Oregon	1,997,563
Illinois	5,150,396	Pennsylvania	5,517,738
Indiana	3,172,253	Rhode Island	609,375
Iowa	3,330,593	South Carolina	1,769,846
Kansas	3,397,874	South Dakota	2,045,077
Kentucky	2,356,367	Tennessee	2,087,123
Louisiana	1,745,445	Texas	7,620,239
Maine	1,121,860	Utah	1,416,493
Maryland	1,051,714	Vermont	609,375
Massachusetts	1,815,916	Virginia	2,379,788
Michigan	3,652,393	Washington	1,940,922
Minnesota	3,497,306	West Virginia	1,324,680
Mississippi	2,209,509	Wisconsin	3,075,234
Missouri	3,957,287	Wyoming	1,568,905
Montana	2,580,405		
		Total	$121,877,000

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Liens Against Buildings Constructed by Tenants

That a lien claim in a given case may afford as slippery a hold as a grasp upon a greased pig is shown by the decision rendered by a New Jersey court, May 22, 1929, in the case of Harris v. Bergamo, 148 Atl. 645. It was decided that, under the New Jersey Lien Law, where a tenant caused a building to be erected on leased premises without the landlord's written consent and the lease was terminated on account of bankruptcy of the tenant, no mechanic's lien, on account of erection of the building, could be enforced against the landlord's interest in the structure. The circuit court of New Jersey for Essex County said, in part:

"Where the building is erected by the tenant or other person, the statute is clear that only the building and the estate of such tenant or other person erecting such building shall be subject to the lien. The plaintiff's claim is that the lien may run against the building as distinguished from the land, even though the estate of the tenant is terminated. I cannot agree with this construction.

"As I understand it, the building has become part of the freehold, and to permit a lien upon the building after the termination of the tenancy would be, in effect, to permit a lien against the estate of the owner as distinguished from the estate of the tenant. This, I think, is not intended by the statute. It might be that in some cases, where the building could be removed at the end of the tenancy, that a person who had a claim for furnishing work or materials for that building might assert his rights against the building, but when the building has become part of the freehold, and the tenancy has been terminated, that right of lien is lost."

When the Owner Jilts the Contractor

Just as the law allows the assessment of "heart balm" against a "gay deceiver," so the law prevents an owner from jilting a contractor without incurring responsibility in damages. In fact, it is easier to fix the amount of the contractor's loss than to determine what damage should be paid for breakage of a maiden's heart.

In a case lately before the United States Circuit Court of Appeals, Eighth Circuit (White River Levee District v. McWilliams Dredging Co., 40 Fed. 2d, 873), the court reaffirmed the proposition that, as a general rule, the damages recoverable against an owner for refusing to permit a contractor to carry out his contract is the amount expended by the contractor toward performance, less value of materials, and profits that would have been realized had complete performance been permitted. But the court added:

"While the above-quoted rule of law allows recovery for 'what he has already expended toward performance,' such expenditure must be 'fairly and in good faith' laid out, and must not be 'extravagant, and unnecessary for the purpose of carrying out the contract.' "

The court further notes that money expended for equipment useful in performing future contracts, as well as the one under consideration (in this case a dredge boat), is not chargeable against the owner as an item of damage, although the cost of moving the dredge would be.

Treacherous Partners

Where a member of a contracting firm sees a chance to get a valuable contract for the partnership, but secretly diverts it to a new organization which he intends to join, dissolving the old firm, has his old associate any rights within the law?

According to the decision announced by the New York Supreme Court for Kings County February 20, 1930, in the case of Sorensen v. Nielsen, 240 N. Y. Supp. 250, the aggrieved member of the old firm can require his retiring associate and the new organization to account to him for his share of the profits on the business that should have been secured for the old firm.

The court applies the well-settled rules of law that partners must "tote fair" with each other to the highest degree of fidelity; and that where the circumstances are such that it is just that an advantage be secured for partnership benefit, one or more members of a firm are not entitled to divert the advantage to their own benefit and to the prejudice of an associate or associates.

The rules just stated are usually applied where a partner unfairly attempts to secure for himself renewal of a lease on premises occupied in carrying on the firm business, instead of renewing it in the partnership name. But the court shows that the same legal principles apply to all sorts of advantages in which all members of a firm are justly entitled to share.

Of course, this does not mean that where a dissolution is in prospect all the members may not be free to compete openly with each other in securing contracts for themselves with people dealing with the firm. But it does mean that they must "deal openly and above board" so long as the firm continues to exist.

Public Contractor Held Bound for Teams and Drivers Furnished to Subcontractor

A contractor for construction of a city light and water plant gave a statutory bond binding him and subcontractors to pay for all labor and materials furnished for the job. The work of excavating was sublet, and the subcontractor hired plaintiff to furnish men and teams at $7.50 per day for each team and driver. This price not being paid, plaintiff sued the city, the general contractor, the general contractor's surety and the subcontractor. Upholding his right to recover against the general contractor and the surety, the Louisiana Court of Appeals said in the case of Childers vs. City of Monroe, 122 So. 135, decided May 8, 1929:

"The confusion in this case, we think, has arisen over a misconstruction or a misinterpretation of the contract between the plaintiff, Childers, and the subcontractor, Walker . . . . The parties seem to have called this a contract for mule or team rent. But whatever they may have called it, it was in fact a contract to excavate, move dirt in connection with the building of the water and light plant. Childers, the plaintiff, hired his own drivers and put them in charge of his teams, and with the teams and drivers the work was done. . . . Our construction of the contract is that it was no more nor less than a contract to do work, and that plaintiff's claim is fully protected by the contract and bond."

Puzzle: Find the Employer

The Connolly Contracting Co. owned and operated steam shovels in its business. Morris & Dougherty were railroad contractors and hired one of these shovels and two of the contracting company's men to operate it on a job in another state, at Janesville, Wis. After the work was finished, and while these two men were on their way back home in St. Paul, Minn., where the offices of the contracting company and Morris & Dougherty were also located, they were killed when a train struck the automobile in which they were riding.

There was no dispute but that either the company or Morris & Dougherty were bound to pay the men's dependent families awards under the Minnesota Workmen's Compensation Act. But disagreement arose as to which was the employer of the men at the time of the fatal accident.

The men were paid their wages by Morris & Dougherty, the borrowers of the shovel, but the court decided that this did not make the men employees of that firm. The court said:

"M & D did not select the men in the first instance; did not have the right to discharge them or to put men of their own selection (either regular employees or otherwise) in charge of the shovel."

Hence, it was decided that the men were employees of the contracting company. (Campbell v. Connolly Contracting Co., 229 N. W. 561.) But the decision was reached by a bare majority vote of the court. The chief justice and an associate justice were of the opinion that Morris & Dougherty should be held to have been the employers at the time of the accident. The remaining three judges, constituting a majority, decided otherwise.

Nondelivery of Crushed Stone to Contractors Was Excused

"We will sell you all of the crushed stone you need for that road job at $1.40 per ton f. o. b. cars," said a limestone company to highway contractors. A written contract was concluded on that basis, but it provided that "all orders and contracts are accepted subject to contingencies of manufacture and shipping and other causes beyond seller's control."

Later on the contractors claimed that the company had inexcusably failed to deliver the full quantity of stone required, necessitating their making a purchase elsewhere at an increased price. They sued the company for reimbursement against the increased cost, but lost their suit. The company proved that it was prevented from making the agreed deliveries in full through breakage of a shaft in its stone crusher, and the Oklahoma Supreme Court decided that this accident constituted a legal excuse for nondelivery, under the above quoted clause, making all "contracts . . . subject to contingencies of manufacture," etc. (Maxwell v. Zenith Limestone Co., 286 Pac. 879.) Had that clause, or a similar one, been missing from the contract, the breakage of the shaft would not have excused nondelivery.

The court, however, ruled that the buyers of the rock were debarred from recovering damages in this case on the independent grounds that they had failed to prove what was the fair market value of the stone at the time and place agreed upon for delivery, as a basis for the assessment of damages. What the buyers paid another company for substitute stone was not proof of market value, the court said.

Responsibility in Operating Steam Power Equipment

However desirable it may be for one to "hew to the line, let the chips fall where they may," this adage should not be so far extended as to say, "Fire the old steam boiler, let the sparks fall where they may."

A contractor, in constructing a dam in the Blue Ridge Mountains in North Carolina, set up a steam boiler, with a 9-foot smokestack, within 20 or 30 feet of wooded land. Escaping sparks started a fire that raged through the mountains for two days.

In the case of J. B. McCrary Engineering Co. v. White Coal Power Co., 35 Fed. 2d, 142, the United States Circuit Court of Appeals decided that the contractor was properly held liable, on the ground of neglect to equip the boiler with a spark-arrester and to remove inflammable material nearby.

City Held Not Liable to Contractor for Detroit in Special Assessment Fund

Warrants were issued by an Oregon city to a construction company for paving and building sidewalks, but were drawn against a special assessment fund. Some of the property owners failed to pay their assessments and at a sale of the property for these taxes no one bid the amount of the assessments. The city thereupon acquired title to the property. In subsequent litigation, the construction company unsuccessfully contended that the city became obligated to pay into the special assessment fund an amount equal to the delinquent assessments, with interest. Said the Oregon Supreme Court in an opinion handed down June 11, 1929, in the case of City of Newberg vs. Warren Construction Co., 278 Pac. 96:

"There was no dereliction of duty on the part of the city. It did everything within its charter powers to create, by special assessment proceedings, sufficient funds to pay the warrants issued. The contractors were bound to take cognizance of the powers vested in the city by its charter. They knew that the cost of these improvements was to be paid by levying a special assessment against abutting property owners who were specially benefited, and that it could not be paid by a general tax. . . . If the liens upon the property were not sufficient security for the payment of warrants, the holders thereof would have no recourse against the city unless the deficiency in the special assessment funds was due to some negligent act of omission or commission on the part of the city."

Check Held Too Long

"Mr. Sanders, that check for $62.80 that you gave me last week was not paid because the bank closed," said one Georgian to another. "Please let me either have cash or a check for the amount on a bank that is open."

"But, my dear Mr. Lifsey," replied Mr. Sanders, "I gave you the check last Thursday noon, and the bank did not close until Saturday afternoon. It was only two blocks away and had you presented the check any time during banking hours on Thursday afternoon, Friday or Saturday, you would have gotten the cash that it called for. By giving you the check I guaranteed that it was good and would be paid if presented within a reasonable time, but I did not by word or act guarantee the solvency of the bank for all time to come."

Mr. Lifsey couldn't see it that way, and there is where the lawyers and courts came in. Each side spent more than the amount the check called for to get a court ruling as to who was "stuck."

The Georgia Court of Appeals, following what most other courts of authority have decided, said (153 S. E. 104) that delivery of a check from debtor to creditor does not imply that the check is to be treated precisely the same as cash. There is an implied understanding that the payee will use reasonable diligence to collect the check. It is only fair that he take the risk of the bank breaking during the period of unreasonable delay on his part in presenting the paper for payment.

Construction Industry News

Truscon Steel Co., Youngstown, O., has announced the appointment of Wharton Clay, architectural and contracting engineer, to its staff. Mr. Clay was formerly Sales Engineer, U. S. Gypsum Co., and Commissioner of the Associated Metal Lath Manufacturers. His duties with Truscon will include the promotion of the friendly service which Truscon aims to extend to the profession and trade, the extension of contacts with larger projects which involve permanent building products and the development of fields for the application of new ideas in merchandising.

Hercules Motors Corp., Canton, O., has announced that the Automotive Products Co., sole distributor of Hercules engines and power units for Great Britain and Continental Europe, exclusive of U. S. S. R., will in the future be located at Brook House, Langham St., London, W. 1, England.

Universal Atlas Cement Co., Chicago, Ill., has announced the appointment of Paul C. Van Zandt as an additional Assistant to the President. Mr. Van Zandt's duties will be in connection with operation and engineering.

Dow Chemical Co., Midland, Mich., has suffered the loss of its President, Dr. Herbert H. Dow, who died suddenly on Wednesday, October 15. Dr. Dow was generally recognized as one of the five foremost chemists in the country. Willard H. Dow, a member of the Board of Directors and for the past four years Assistant Manager, has been elected President and General Manager to succeed Dr. Dow.

Sterling Tractor Equipment Co., 62 Bush St., Brooklyn, N. Y., has announced the appointment of Wm. E. Law, formerly head of the Tractor Department of the New York Branch, Ford Motor Co., in charge of the Sterling Co's. engineering, manufacturing, repair, parts and service departments.

G. H. Williams Co., Erie, Penna., makers of the Williams Champion series of buckets and heavy-duty trailers, has appointed A. F. Deaney, of Indianapolis, Ind., as its distributor for Southern Indiana, and the Stockberger Equipment Co., Fort Wayne, Ind., as its distributor for Northern Indiana.

National Carbon Co., Inc., Carbon Sales Division, Cleveland, O., on November 1 took over the entire line of Gredag lubricants manufactured by the Acheson Graphite Corp., a unit of the Union Carbide and Carbon Corp.

Worthington Pump & Machinery Corp., 2 Park Ave., New York, has announced that it has acquired the Gilman Manufacturing Co., East Boston, Mass. The Worthington Corp., is thus expanding its line of pneumatic service to mines, quarries, contractors and industry by adding the Gilman line to the well-established line of Worthington Feather Valve air compressors.

American Hoist & Derrick Co., Saint Paul, Minn., has announced the removal of the Dayton, O., office to Indianapolis, Ind., where I. R. Bailey and Wm. M. Schoen will carry on at 703 New City Trust Building. Announcement is also made that J. T. Conners, formerly Detroit district manager for Thew, will now have charge of American Gopher sales for the American Hoist & Derrick Co.

Independent Pneumatic Tool Co., 600 West Jackson Boulevard, Chicago, Ill., has announced the election of Charles W. Pendock, President of the Le Roi Co., Milwaukee, Wis., as a director of the Independent Pneumatic Tool Co. Le Roi gasoline engines are used exclusively in Thor air compressors.

Construction Machinery Co., Waterloo, Ia., and L & P Manufacturing Co., Ltd., Niagara Falls, Ont., have entered into an agreement for the manufacture of Wonder drum concrete mixers and Marsh-Capron Master drum type mixers for Canadian distribution. The smaller sizes of both lines will be put into production immediately, and as quickly as consistent, larger sizes will follow. F. H. Fowler, President of Construction Machinery Co., will be a director of the L & P Manufacturing Co.

The Power Manufacturing Co., Marion, O., maker of Victor diesel type engines, has announced the completion of its distributors organization and its regional sales districts. The regional representatives are: L. R. Johnson, Marion, O., for the Northern region; H. G. Stuart, 1716 Faxon Ave., Memphis, Tenn.; Cuvis Carey, 113 Murray St., Dallas, Tex.; B. H. Rice, Marion, O., for the Western region, and Arthur F. King, 111 Sutter St., San Francisco, Calif. G. V. R. Mulligan is Manager in charge of diesel engine sales for the company.

Chain Belt Co., Milwaukee, Wis., has announced that the street address of the main office, grey iron foundries, and the chain manufacturing plants has been changed to 1600 West Bruce St., Milwaukee, Wis. The former address was 736 Park St. The address of the West Milwaukee works where the concrete mixer plant, the engineering and conveyor plants, and the malleable foundries are located has been changed from 59th Ave. and Orchard St., to South 45th and Orchard St. This is due to a re-naming of the streets. The address of the Cleveland Division, the Stearns Conveyor, will remain East 200th St. and St. Clair Ave., Cleveland, O.

This company also has announced the following elections and appointments: C. F. Messinger, Vice President and General Manager; Brinton Welser, Vice President and a Director; A. R. Abelt, Secretary; H. S. Greene, General Sales Manager; W. H. Brandt, Assistant to the President.

Chain Belt Co., has recently announced the appointment of two new distributors in the construction equipment field: Alabama Machinery & Supply Co., Montgomery, Ala., and Concrete Products Sales Co., Ltd., Oakland, Calif.

Chicago Pneumatic Tool Co., New York, has recently completed the erection of a fully equipped two-story service station located at 570 East Larned St., Detroit, Mich. This is one of twenty similar fully equipped and stocked service stations maintained by this company in important cities throughout the United States in order to insure users of CP tools the best and quickest service possible.

Maximum Spans for Joists and Rafters

A NEW handbook for the guidance of architects, engineers, contractors and builders has recently been published by the National Lumber Manufacturers Association. This book, entitled "Maximum Spans for Joists and Rafters," contains span tables for joists of various sizes and spacing, and with different live loads for plastered as well as unplastered ceilings, and for deflection limited to 1/360-inch and as determined by bending; tables for maximum spans of ceiling joists, attic floor joists, rafters and roof joists; a complementary table dealing with the area of cross section, weight per linear foot, moment of inertia and section modulus of American standard timber sizes.

Copies of this publication may be secured upon application to the National Lumber Manufacturers Assn., Washington, D.C.

Distributors' Bulletin Board

New Lines Carried by Construction Equipment Sales Organizations

Additional information in regard to the lines carried by Distributors may be found in the Directory, pages 123 *to* 150 *of this issue of* CONTRACTORS AND ENGINEERS MONTHLY.

B. B. Wilson Co., 139-51 North Mill St., Lexington, Ky., has changed its name to the **Wilson Machinery & Supply Co., Inc.**, and has recently added Allis-Chalmers Mfg. Co., Milwaukee, Wis., and Speeder Machinery Corp., Cedar Rapids, Iowa, to its accounts.

G. M. Stull Co., Chester, Penna., is now distributor for the Stover Mfg. & Engine Co., Freeport, Ill., and Miami Trailer-Scraper Co., Troy, Ohio.

Z. T. Darrow & Son, Niagara St., Canandaigua, N. Y., has added Metalweld-Worthington air compressors, made by Metalweld, Inc., Philadelphia, Penna., to its line of contractors' equipment.

Canadian Equipment Co., Ltd., 1111 Beaver Hall Hill, Montreal, P. Q., has added the following to its accounts: Cleveland Tractor Co., Cleveland, Ohio; Carl H. Frink, manufacturer of Frink snow plows, Clayton, N. Y.; Rotary Snow Plow Co., Minneapolis, Minn.; Austin Mfg. Co., Chicago, Ill.; Butler Bin Co., Waukesha, Wis.; C. O. Bartlett & Snow Co., Cleveland, Ohio; and New England Road Machinery Co., South Boston, Mass.

Lawrence V. Fraley & Son, Buder Bldg., St. Louis, Mo., has added the Speeder Machinery Corp., Cedar Rapids, Iowa, and James B. Searverns Co., Batavia, Ill., to its accounts.

Connelly Machinery Co., Billings, Mont., has recently taken on the line of snow plows manufactured by the Wausau Iron Works, Wausau, Wis.

Hudson Supply & Equipment Co., Seventh and T Sts., N. E., Washington, D. C., has been appointed distributor for the air compressors made by the National Brake & Electric Co., Milwaukee, Wis.

Choctaw Culvert & Supply Co., Second and Butler Sts., Memphis, Tenn., has added the following to its accounts: Gardner-Denver Co., Denver, Colo.; E. D. Etnyre & Co., Oregon, Ill.; Euclid Crane & Hoist Co., Euclid, Ohio; Le Roi Co., Milwaukee, Wis.; and Drake-Williams-Mount Co., Omaha, Nebr.

Havre Tractor & Equipment Co., Havre, Mont., is now handling the line manufactured by the Euclid Crane & Hoist Co., Euclid, Ohio, in addition to the lines previously handled.

Clyde Equipment Co., Portland, Ore., and Seattle, Wash., has recently added the Atlas Imperial Diesel Engine Co., Oakland, Calif., to its accounts.

Balzer Machinery Co., 275 Pine St., Portland, Ore., is now distributor for the vibrating screens manufactured by the Niagara Concrete Mixer Co.

C. H. Loomis & Co., 304-306 Jelliff Ave., Newark, N. J., has recently added the Cleveland Rock Drill Co., Cleveland, Ohio, to its accounts.

Cyril J. Burke, Great Lakes Terminal Warehouse, Detroit, Mich., has recently added the following to his accounts: Highway Truck Mixer Co., Cleveland, Ohio; Hercules Motors Corp., Canton, Ohio; J. M. Willard Co., Los Angeles, Calif.; and J. I. Case Co., Racine, Wis.

F. W. Gartner Co., 1100 Milby St., Houston, Texas, is now representing the Union Iron Works, Hoboken, N. J., in addition to the lines previously handled.

G. E. Hillsman Co., 228 No. La Salle St., Chicago, Ill., has recently taken on Monarch tractors, made by the Monarch Tractor Div., Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

Julien P. Benjamin, Inc., 21 N. Ocean St., Jacksonville, Fla., has added the following to its accounts: Standard Conveyor Co., North St. Paul, Minn.; National Colortype Co., Bellevue, Ky.; Huber Mfg. Co., Marion, Ohio; and National Hoisting Engine Div., McKiernan-Terry Corp., New York City.

Jeff Hunt Road Machinery Co., Columbia, N. C., is now handling the Ord finishing machines, made by A. W. French Div., Blaw-Knox Co., Blaw Knox, Penna., and Wiard plows, road rippers and scrapers, manufactured by the Wiard Plow Works, Batavia, N. Y., in addition to the lines previously handled.

Joe C. Tucker, Morganfield, Ky., has added the Chain Belt Co., Milwaukee, Wis., and Metalweld, Inc., Philadelphia, Penna., to its accounts.

Evans Tractor & Equipment Co., Main St. and Maple Ave., Rapid City, S. D., has recently been appointed distributor for Euclid Crane & Hoist Co., Euclid, Ohio.

Alban Tractor Co., Inc., 821-23 East 25th St., Baltimore, Md., has added Euclid Crane & Hoist Co., Euclid, Ohio, and the Davey Compressor Co., Kent, Ohio, to its accounts.

The Albert Olson Co., Ltd., 1148-50 Olser St., Regina, Sask., Canada, is now handling the line of automatic scrapers and wagons manufactured by Euclid Crane & Hoist Co., Euclid, Ohio.

P. I. Perkins Co., 376 Dorchester Ave., Boston, Mass., has recently been appointed distributor for the Owen Bucket Co., Cleveland, Ohio, and for Rex pumps, made by the Chain Belt Co., Milwaukee, Wis.

Barnard Tractor & Equipment Co., 15th & Mayflower Sts., Harrisburg, Pa., has recently added to its accounts the Cleveland Pneumatic Tool Co., Cleveland, Ohio, and the Killifer Mfg. Co., Los Angeles, Calif.

Corby Supply Co., 3942-46 West Pine Blvd., St. Louis, Mo., is now handling the line of arc welding equipment manufactured by Westinghouse Electric & Mfg. Co., East Pittsburgh, Penna., in addition to lines previously handled.

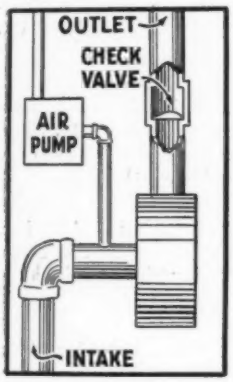
This company has steadfastly refrained from implications and claims which, while literally true, might mislead the readers of its advertising. This series of advertisements will set forth some facts which, we hope, will assist our readers to positive assurance concerning the most satisfactory solutions of their pumping problems.

THE LABOUR CO., INC.
H. E. LaBour

A Single Pump that Moves Both Air and Water

SOME centrifugal pumps for handling water are equipped with auxiliary pumps, usually of the piston type, for handling air. This enables the *combined mechanism* to exhaust the air from empty suction lines and thus prime itself. By means of a float or other device, arrangement is made in such pumps to cut out the air pump when it is not needed.

The principal difficulty encountered by the use of this arrangement is in the fact that a check valve, completely sealing the discharge line from the atmosphere, is essential to its operation. From the schematic diagram herewith, it is easy to see that when the air pump starts to operate it will draw air from the suction line, but unless the check valve in the discharge line is tightly closed, air will enter from that source and consequently no vacuum will be created to cause the water in the suction line to rise to the pump. It is necessary that the check valve be large enough to permit the full discharge of the pump and yet, even without a water seal, it must hold tightly when the apparatus is priming.



Aside from the extra service requirements and the extra danger of breakage and faulty operation resulting from the multiplicity of parts, it is easily to be seen that the check valve in the discharge line presents a very special problem. With a discharge line three or four inches in diameter the circumference of the check valve is anywhere from nine to more than twelve inches which must be tightly closed and yet so constructed that it will open easily and not impede the progress of the discharging water when the pump itself is in operation.

The unique construction of the LaBour Pump makes it the only centrifugal pump which is capable of handling both air and water in the same pump without any recirculation, after prime has been established, and without any floats, valves, diaphragms or other auxiliary apparatus. As may be seen by the illustration herewith, air is entrained with the water in the casing and is thrown out with the water. From the casing it goes to a separator which permits the air to escape out of the pump discharge line and permits the water to drain back into the casing through the secondary opening, provided the casing is not already full of water.

When all of the air has been exhausted from the casing, then the pressure of the outgoing water in the secondary opening is too great to permit the return of water from the separator, and, on the contrary, the water moves out through the secondary opening as well as the first opening. This perfectly simple piece of machinery therefore does all of the work which might be accomplished by the addition of a secondary air pump and check valve, and does it all without the slightest complication which might be caused by the addition of even one more moving part.

LaBour Pumps are the only truly self-priming centrifugal pumps on the market. Their construction is fully protected by patents. Before you buy any self-priming centrifugal pump, make sure that it has no valves of any kind, make sure that it is a single pump and not a combination of two pumps. Only in this way can you be assured of the highest possible efficiency, the greatest dependability and the utmost satisfaction. If you apply these tests you will choose a LaBour.

This is the fourth of a series of advertisements which we shall endeavor to make a veritable primer of pumping. Reprints may be had for the asking.

THE LABOUR CO., INC.
ELKHART, INDIANA

LA BOUR PUMPS

NEVER LAY DOWN ON THE JOB

The Day & Maddock Co., W. 82nd St., S. of Denison Ave., Cleveland, Ohio, has recently added the Northwest Engineering Co., Chicago, Ill., to its accounts.

Graham B. Bright, 901 Electric Bldg., Richmond, Va., is now representing the National Brake & Electric Co., Milwaukee, Wis., in addition to the lines previously handled.

General Equipment Co., Inc., 414 Fourth St., Clarksburg, West Va., has been appointed distributor for the earth-moving equipment manufactured by the Euclid Crane & Hoist Co., Euclid, Ohio.

Michigan Equipment Co., Pontiac, Mich., is now handling the engines, hoists and pumps manufactured by the Novo Engine Co., Lansing, Mich., and the tractors made by the International Harvester Co., Chicago, Ill., in addition to lines previously handled.

Arizona Tractor & Equipment Co., 238 W. Jefferson St., Phoenix, Ariz., has been appointed distributor for the earth-moving equipment manufactured by Euclid Crane & Hoist Co., Euclid, Ohio.

Milburn Machinery Co., 141 N. Front St., Columbus, Ohio, is now handling the bins and batchers made by the C. S. Johnson Co., Champaign, Ill., in addition to its other lines.

Cunningham-Ortmayer Co., 123 W. Michigan St., Milwaukee, Wis., has added to its line Colphalt asphalt emulsion and accessories made by the Colphalt Co. of Ohio, Cleveland, Ohio.

J. Shuman Hower, 106 Foster Bldg., Utica, N. Y., has been appointed distributor for Ransome pavers, mixers, towers, chutes, carts and similar equipment manufactured by the Ransome Concrete Machinery Co., Dunellen, N. J., and for the road graders made by the Gilbert Mfg. Co., Stillwater, Minn.

Perry & Wilson Equipment Co., Inc., 345 E. South St., Indianapolis, Ind., has added P & H shovels and draglines, made by the Harnischfeger Sales Corp., Milwaukee, Wis., to its line of contractors' equipment.

J. D. Wilkins, West Lee St., Greensboro, N. C., has been appointed distributor for the Cleveland Rock Drill Co., Cleveland, Ohio.

Western Material Co., Sioux Falls, S. D., has recently added Euclid Crane & Hoist Co., Euclid, Ohio, and the Atlas Scraper Co., Bell, Calif., to its accounts.

C. O. Monat & Co., Ltd., 5644 Park Ave., Montreal, Canada, has been appointed distributor for the Davey Compressor Co., Kent, Ohio.

J. H. Welch, 21 Terrace, Buffalo, N. Y., has added the Archer Iron Works, Chicago, Ill., to his accounts.

Edelen & Boyer Co., 236 N. 23rd St., Philadelphia, Penna., is now handling the lines of Flory hoists, made by the S. Flory Mfg. Co., Bangor, Penna., and Sauerman drag scrapers and cableways, manufactured by Sauerman Bros., Chicago, Ill.

Geo. W. Ziegler Machinery Co., Pittsburgh, Pa., has been appointed distributor for the clamshell buckets made by the Jos. F. Kiesler Co., Chicago, Ill.

Frank J. Bowers, 417 Terminal Bldg., Youngstown, Ohio, has added the Titusville Forge Co., Titusville, Penna., to his accounts.

The Tractor & Equipment Co., 531 West Van Buren St., Chicago, Ill., has added tractor equipment made by Trackson Co., Milwaukee, Wis.; air compressors manufactured by the Davey Compressor Co., Kent, Ohio, and conveyors manufactured by the Northern Conveyor & Mfg. Co., Janesville, Wis., to its line of contractors' equipment.

Elken Tractor & Equipment Co., Minot, N. D., has been appointed distributor for the Diamond Iron Works, Inc., Minneapolis, Minn.

Herr, "The Pump Man," Lancaster, Penna., has added Metalweld, Inc., Philadelphia, Penna., to his accounts.

Herman M. Brown Co., Des Moines, Iowa, and Omaha, Nebr., has added the following to its line of contractors' equipment: Walter Snow Fighters, made by the Walter Motor Truck Co., Long Island City, N. Y., and B & G lubricants, made by the B & G Lubricant Co., Kansas City, Mo.

Loder & Sharp, Inc., 32nd St. and Powelton Ave., Philadelphia, Penna., has been appointed distributor for Wheeling pipe, made by the Wheeling Corrugated Steel Co., Wheeling, W. Va.

Asheville Supply & Foundry Co., 33 Eagle St., Asheville, N. C., has added the following to its accounts: Metalweld, Inc., Philadelphia, Penna., Cleveland Rock Drill Co., Cleveland, Ohio, and Osgood Co., Marion, Ohio.

K. B. Hubbard Co., Inc., 1122 N. Washintgon Ave., Lansing, Mich., has been appointed distributor for Burch conveyors and crack fillers, made by the Burch Corp., Crestline, Ohio.

C. L. Stith Co., 305 Franklin Bldg., Columbus, Ohio, has added Lakewood paving, building and industrial equipment, made by the Lakewood Engineering Co., Cleveland, Ohio, to its line of contractors' equipment.

Garlinghouse Bros., 2044 Sante Fe Ave., Los Angeles, Calif., has been appointed distributor for Ransome concrete placing equipment, made by the Ransome Concrete Machinery Co., Dunellen, N. J.; National hoists, a product of the National Hoisting Engine Div., McKiernan-Terry Corp., New York City; Schramm compressors, made by Schramm, Inc., West Chester, Penna.; and Burch spreaders, manufactured by the Burch Corp., Crestline, Ohio.

Geisbeek Engineering Co., Arctic Bldg., Seattle, Wash., has been appointed distributor for Hanson excavators, made by the Hanson Clutch & Machinery Co., Tiffin, Ohio.

The Young and Vann Supply Co., 1725-1731 First Ave., Birmingham, Ala., has been appointed distributor for Huber road rollers, made by the Huber Mfg. Co., Marion, Ohio.

Syracuse Supply Co., Syracuse, N. Y., has been appointed distributor for Union Iron Works, Hoboken, N. J.

Chadwick Machinery Co., 125 Blue Star St., San Antonio, Texas, has been appointed distributor for the Austin Machinery Corp., Chicago, Ill.

. . . Out of Reach . Out of Luck . . .

GOOD roads are as beneficial to the farmer in a business sense as they are to the motorist in a pleasure sense. Almost any rural community that will plan ahead can obtain the right Tarvia roads as easily as urban centers obtain the more advanced Tarvia pavements.

If communities wait until they have all the money for roads that they would like to have, out-of-reach, out-of-luck farmers are going to be much more numerous than they are now.

The Tarvia organization, with its 26 years of road-building experience, offers practical, money-saving cooperation to road officials who must make a little road money do the work of a lot.

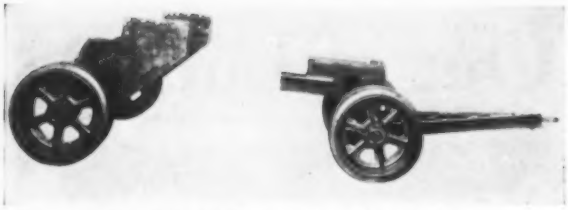
Tarvia field men can show you how to meet immediate—and future—needs inexpensively. With Tarvia a road can be developed and widened through successive stages, keeping it at all times suited to the load it must carry. For further information 'phone, wire or write our nearest office.

The Barrett Company

New York, Chicago, Philadelphia
St. Louis, Minneapolis, Boston
Detroit, Cleveland, Birmingham
Buffalo, Columbus, Milwaukee
Providence, Syracuse, Cincinnati
Baltimore, Toledo, Rochester
Lebanon, Youngstown, Bethlehem
Hartford

In Canada:
THE BARRETT COMPANY, Ltd.
Montreal Toronto Winnipeg Vancouver

Tarvia
GOOD ROADS
at LOW COST



The Essential Units of the Byers Trailer

A Lightweight Trailer for Moving ⅜-Yard Shovel

A NEW style rubber-tired trailer for transporting Model-40, ⅜-yard Byers shovel and crane which weighs 10 tons, has been announced by the Byers Machine Co., Ravenna, Ohio. Unlike trailers of the platform type, this Byers trailer consists of only two separate sets of heavy rubber-tired wheels on bar axles, which are temporarily attached to structural brackets on the under side of the trailer bed frame when the unit is to be moved. Any 5-ton truck or small tractor can haul the Model-40 on this trailer by hooking up to the tongue on the front wheel and axle assembly. By using the 3-point suspension principle the front axle can make short turns and is held with a single bolt under a heavy trunnion and bearing. The rear axle is held by two U bolts. To attach or dismount the trailer only these three bolts need to be taken off after the crawlers have been run onto blocks which allow the wheels to rise off the ground.

The rear axle assembly when not in use can be carried on a rack behind the cab, thus acting as additional counterweight. It has been said that two men can dismount the trailer in 20 minutes or assemble it within 30 minutes,. The attachment weighs only 3,700 pounds.

An Adaptable Clamshell—Dragline—Crane

FOR digging and loading sand, gravel, crushed stone and other bulk materials, stripping pits, loading and unloading barges and cars, making material yard storage and stock piles, excavating for drainage ditches, cofferdams and levee work, backfilling, driving and pulling piling, placing forms, steel and concrete, laying pipe lines and various other operations, Wiley Whirleys are especially adaptable and economical.

These machines, built by the Dayton Whirley Co., Dayton, Ohio, since 1919, are made in six sizes with booms from 50 to 100 feet and lifting capacities from 5 tons at 50-foot boom radius to 10 tons at 100 feet. For short radius their lifting capacities range from 15 to 50 tons. Bucket capacities range from 1 yard to 3½ yards, either clamshell or dragline. They may be had with skid and roller mounting, track wheels, gantry towers either with or without wheels, and crawler mountings for the two smallest models. Self-propulsion is optional. They may also be mounted stationary on piers or barges.

Wiley Whirleys are simple in design, rugged in construction and reliable in operation. Essentially they are traveling, revolving, long reach, heavy duty steel derricks which combine the advantages of the locomotive crane and stationary derrick without their limitations as to stability and mobility.

The design involves a minimum of moving parts, and all of these easily accessible. Material is structural and cast steel throughout, alloy steels being used where necessary to secure extra strength and wear. Lower frame girders are designed to take the total maximum dead and live loads concentrated at any single point. The main section of the upper or rotating frame has eight full length, unspliced structural members, which permit carrying a very heavy counterweight load to balance the unusually heavy live loads which these machines can handle at long reach. The rail circles are relatively large in diameter for stability and are firmly anchored to the lower and upper frames. The turntable rollers are of alloy cast steel, double flanged and have coned treads to provide a true rolling motion. Unbalanced horizontal forces developed in operation are taken care of by a heavy steel center casting, or king pin, which is hollow to accommodate steam or water pipes or electric cables.

The boom is of the box girder type with corner angles and diagonal angle lacing on all sides. It has a large center depth, wide heel spread and ample internal bracing to withstand not only the straight axial compression, but bending stresses produced by the compressive loadsand by swinging. It is built in three sections with ample connection plates for field assembly.

The machines are rotated either by a gear or a cable swing and at speeds of from 1½ to 3 rpm. On gear swing machines a heavy cast steel rack of large diameter is securely bolted to the lower frame and the power is transmitted to it through a train of spur and bevel gearing from an electric motor, or steam driving engine with reversible control. On the cable swing machines a single drum swinging engine is used, with reversing control, operating two swinging cables which pass around the lower rail circle as a bull wheel and are dead ended on the lower frame. An efficient and convenient screw adjusting device is provided for taking up any slack in the cables.

On clamshell machines a tagline counterweight frame is provided for automatically controlling the slack in the tagline, which is used to keep the bucket from twisting. On dragline machines an efficient fairlead device is provided for taking care of the lead of the drag cable. On all machines a fairlead device is provided at the boom point for controlling the lead of the hoist lines to the boom point sheaves.

Machines are furnished with steam, electric or gasoline power as desired. Ample strength in the engine frames and in the clutches and brakes are provided for handling the loads for which the machine is designed. Hoist line speeds range from 170 to 200 feet per minute on single line. Drums and rope sheaves are large in diameter relative to the size of rope working on them, the usual ratio being about 24 to 1. The engines are controlled from levers banked in quadrant at the forward right hand corner of rotating frame, from which point the operator has an unobstructed view of both his work and power units. Sufficient clearance for working room is provided around power units.

Cabs may be had in either wood or steel. These are sectional and conveniently assembled or disassembled. Change of reeving from bucket to hook block or magnet, or vice versa, may be accomplished very quickly.

Wiley Whirleys are not perfectly standard machines but each is built more or less special to meet the customer's particular conditions and requirements.

A Wiley Whirley Dragline

A Blair Hydraulic Digger Mounted on an Allis-Chalmers Model U Tractor With Wehr Double-Duty Cleated Wheels

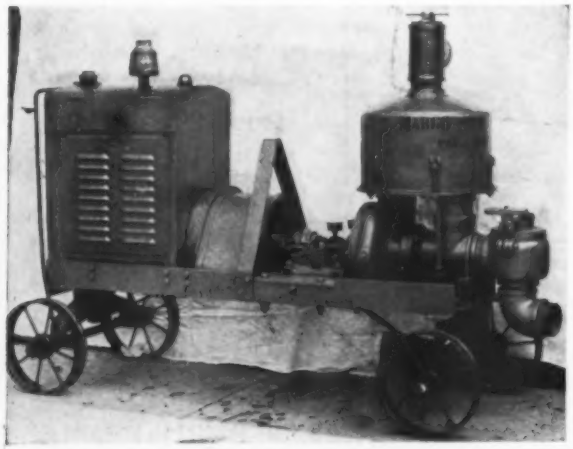
A Tractor-Mounted Hydraulic Digger

THE W. M. Blair Mfg. Co., of Chicago, Ill., recently announced a Blair hydraulic digger for mounting on Allis-Chalmers Model U tractors for either the wheel or crawler industrial models. A bucket of ½-yard capacity handles 20 to 25 yards of loose bulk material per hour. It will pick up such material as ashes, crushed stone, fertilizer or earth, carry it 100 feet and dump it at the rate of 15 to 20 yards per hour. It is used for handling material on road construction, road maintenance, for excavation work, for snow removal, and in foundries and by public utilities.

The pump on this digger is mounted on the side power take-off of the tractor. The cylinder is of Shelby seamless steel tubing with a 5½-inch piston. The total lift of the digger is 90 inches and the dumping clearance is 6 feet 6 inches.

A Pump for Well Point Work

THE reliability and high vacuum developed in the improved MarlO self-priming centrifugal pump, made by A. S. Marlow, Ridgewood, N. J., make it especially adaptable for well point work. Because of the absence of priming pumps, traps, floats, etc., there is no need for an experienced mechanic to attend the pump during the night and the watchman may be instructed to supply gasoline to the engine. No other attention is required and the outfit may be operated continuously night and day.



The MarlO Self-Priming Centrifugal Pump

Apart from the centrifugal pump itself there is only one moving part in the priming mechanism and that may be removed without interfering with the priming ability of the pump. The pump will still prime on lifts up to 26 or 27 feet and will operate when this automatic cutout is removed, the only effect being to reduce the capacity slightly.

There are no small air pipes, floats, or traps which may freeze in cold weather and the volume of water in the hose, tank and other parts is large enough so that when the pump is in operation, there is no danger from freezing. A convenient plug is provided at the bottom of the pump casing through which the water may be drained when the pump is not in operation.

A flat rubber check valve at the suction side prevents the water in the tank and pump from flowing back into the suction line and makes it possible to disconnect the suction hose, so that the pump may be moved from place to place without losing the priming water in the tank.

Three-Way Die Stocks

AS companion tools to the No. 3 Beaver Jr. ratchet, the Borden Co., Warren, Ohio, has recently brought out the new Beaver 3-way die stocks. The electrically heat-treated die segments of these new die stocks are square in shape and are driven by the solid body of the tool. Large openings in the body provide easy oiling and chip clearance.

The die retaining ring is made of pressed steel, a pinch of 1/32-inch holding the dies rigidly in position. Extra heavy and extra long handle bosses are provided so that the handles will not work loose.

The New Beaver Three-Way Die Stock

These tools are light in weight and fully self-contained with no loose parts. Dies and die retaining rings are interchangeable with the No. 3 Beaver ratchet. Full width dies are provided, equally serviceable for threading steel, wrought-iron or brass pipe. They can be inverted for threading short nipples.

A New Door Control for Dump Wagons

A SIMPLE and easily operated door control which can be attached to Western crawler dump wagons now in the field as well as to new wagons, has recently been developed by the Western Wheeled Scraper Co., Aurora, Ill. This Western spring wind-up is a new departure in door control mechanism and operates through gravity and spring action.

The mechanism consists of a large spring with sufficient initial energy to close the doors tight under all conditions, a toggle and ratchet arrangement, completely enclosed, to hold the doors closed against a load and open against the spring pressure, a pawl and ratchet device so constructed that a single pull on a rope running to the tractor or on the lever to which the rope is attached will trip the load, and a second pull will close the doors when the wagon has moved forward free of the dumped load. As this mechanism is controlled at all times by either the tractor driver or the man on the dump, there is no need for an additional man to trip and wind up the doors. No extra attachments are needed for the tractor.

A One-Man Tractor-Powered Shovel

A ONE man tractor shovel designed for high speed operation and powered by an Allis-Chalmers Model U tractor, has been developed by Bay City Shovels, Inc., Bay City, Mich. This shovel is recommended by the manufacturer for jobs which do not require heavy machines. One of its features is economy of operation made possible by its comparatively light weight and its compact design. Another factor which aids low cost operation is that a three-quarter swing enables this machine to maintain part revolving economy. The shovel can work in close crowded quarters such as in stone quarries, tunnels or inside a manufacturing plant.

The unit is mounted on long full crawlers which carry a pressure of only 6 pounds per square inch of ground surface. The working weight is 10 tons. The construction is all-steel throughout, the gears are machine cut and the shafting is of special analysis. Timken and Hyatt roller bearings are used. The shovel has a ⅜-yard capacity.

The Bay City ⅜-Yard Shovel Powered by an Allis-Chalmers Model U Tractor

The machine is quickly convertible from shovel to clamshell, dragline, trench hoe or skimmer, one man operating in each case. It has three propelling speeds up to 4 miles an hour, permitting the machine to be moved as desired. This shovel is not an attachment for the tractor as the Allis-Chalmers power plant is installed as a permanent unit.

A New Portable Electric Generator

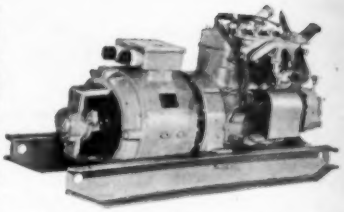
IT is no longer necessary to leave electrical tools in the shop when work is to be done in the field, nor is it necessary to depend upon kerosene or other similar lamps for light. Working under such handicaps and inconveniences can be done away with through the use of the Northwest power and light unit, made by the Northwestern Manufacturing Co., Milwaukee, Wis.

These portable units are made in 1½, 3 and 5-kw sizes. Each is mounted on an arc-welded steel base and is entirely enclosed. The weather-proof protective covers are easily removed or can be locked in position to prevent the unit from being tampered with when not in use.

The 1½ and 3-kw sizes have fuse protection against overload and are equipped with slip plug connections for two circuits. The 5-kw size is equipped with a panelboard containing a voltmeter, rheostat and knife switch with overload protection fuses.

To operate the Northwestern unit it is necessary only to start the engine and turn the switch on for the tools or lights. Hot summer weather or cold winter winds do not interfere with its operation.

The 1½-kw unit generates current at 110 or 220 volts and is powered with a 2-cylinder, 5-horsepower gasoline engine operating at 1,450 rpm and has a pole compound wound generator direct connected to the engine. The unit is 30 inches high, 20½ inches wide, and 41½ inches long and its shipping weight is approximately 700 pounds.



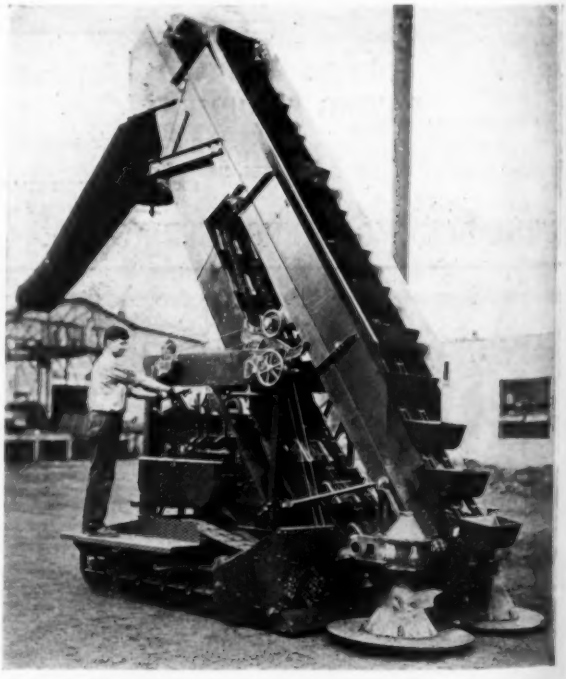
The New Northwestern Portable Electric Unit for Furnishing Power and Light on Construction Work

The 5-kw unit generating current at the same voltage is powered with a 4-cylinder engine of 12 horsepower, operating at 1,450 rpm. It has the same type of generator and same dimensions as the smallest unit except that it is 60 inches long, and weighs approximately 900 pounds.

New Large Capacity Bucket Loader

AS an addition to its standard line of crawler and wheel type bucket loader with capacities ranging from 1 to 1¾ yards per minute, the Barber-Greene Co., 485 West Park Ave., Aurora, Ill., now announces a new large capacity super loader, the Model 62 crawler-mounted bucket loader. This new machine has a height of 19 feet 4 inches, a clean-up width of 7 feet 6 inches, and a capacity of 2 cubic yards a minute. It is a crawler-mounted, power-propelled, one-man loading unit, and is designed for work wherever loose bulk material need be handled, its great height and high capacity making it a very efficient tool for loading trucks in pits and its strong disc feeding arrangement making it usable for trimming subgrade.

It can feed from the bank or from stock piles and, when equipped with one of several types of Barber-Greene proportioning hoppers, it is excellent for batching on paving jobs. It



Barber-Greene Model 62 Super Loader

may also be had with a grizzly or power-vibrated screen.

The machine has centralized control, steering levers, master clutch pedal, transmission shift lever, power boom hoist lever, bucket line drive lever, crawler speed change lever and scraper hoist wheel all being centered about the operator's platform.

The patented overload release sprocket insures against strains due to overload. It is built in two parts, the outer rim which carries the drive chain and the inner part which is keyed to the head shaft that drives the bucket line and is held against the outer rim by two strong springs. When too great a load is placed on the buckets, the springs compress, allowing the outer rim to turn without having any effect on the bucket line. A similar safety sprocket is used on the crawler drive shaft in this model, tripping only when the power transmitted is excessive and thus preventing damage.

The loader feeds itself by means of two large 42-inch discs that revolve inward toward the buckets. These discs are flat on the ground and slide under a pile or into a bank. They crowd enough material onto the buckets to keep the machine working at a 2-yard-a-minute rate and yet, by their construction, are not dangerous to workmen. The floating, adjustable scraper cleans a path 7 feet 6 inches wide, an important feature in loading from stock piles where a clean pick-up is desired.

The patented floating boom is designed so that the thrust from the feeding end is transmitted direct to the crawlers and the power from the crawlers is used most efficiently.

A Part of the Amarillo Fleet of Paris Transit Mixers Mounted on Reo Speedwagons

Truck-Mounted Concrete Mixers

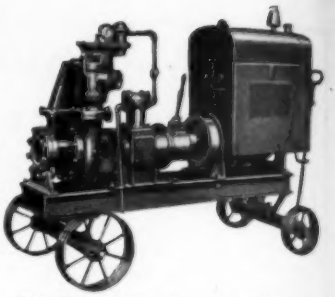
IN Amarillo, Texas, recently, the Crowe Lime & Cement Co. started a fleet of Paris Transit mixers, made by Transit Mixers, Inc., 436 Call Bldg., San Francisco, Calif., mounted on Reo Speedwagons and permitting the mixing of concrete as the fleet moves from the central proportioning plant along the highway to the job.

The method of operation is simple. The mixer is operated by means of a power take-off on the drive shaft permitting positive regulation of the speed at which the concrete is mixed. Sand, cement and water are introduced into the mixer in measured quantities which makes for as good and accurate a mixture as can be obtained in a stationary mixing plant. This positive control of material permits delivery of the certified concrete of pre-determined strength, improved by the fast, thorough and long mixing provided in transit from the bins to the job.

The Reo trucks after thirty days of operation, proved to be economical and capable of satisfactory operation on jobs requiring delivery of the material over rough grounds to areas not easy of access.

A Self-Priming Centrifugal Pump

WHEN dewatering excavations, it is often necessary not only to remove the water, but to force it to a higher point away from the pump. For this type of service the Humphryes self-priming centrifugal pump recently announced by the Humphryes Mfg. Co., Mansfield, Ohio, is well adapted. It is both a lift and force pump and has a total head and lift of 50 feet.



The Humphryes Centrifugal Pump

This pump is of the open impeller type and designed primarily for self-priming service. Because of the large clearances of the open impeller type and the fact that the priming device is entirely separate from the water, it is excellent for handling muddy and gritty water usually encountered in construction jobs.

The vacuum pump is exceptionally large and naturally makes the unit capable of quicker priming and higher suction lifts, and at the same time, less sensitive to small leaks in the suction line. The vacuum pump shaft is mounted on Timken roller bearings and counterweighted to eliminate vibration.

The pump is operated by a 4-cylinder industrial type engine, and a Twin Disc friction clutch is provided on every pump for disconnecting the vacuum pump when not needed.

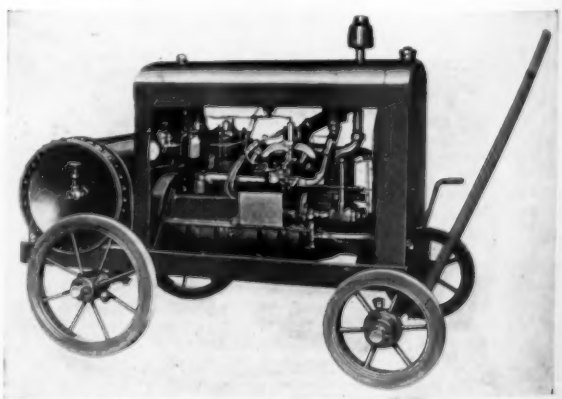
The bottom of the float chamber slopes steeply enough to carry away all sediment. The drain to the suction line is 2½-inches in diameter, so that accumulation of sediment is almost impossible.

Two heavy-duty ball bearings support both ends of the impeller shaft, both of which are outside the water pump casing and are thoroughly protected against grit and water.

A New Small Size Portable Air Compressor

AN air compressor with a displacement of 74 cubic feet for use in operating a single paving breaker, rock drill or riveting hammer, has been announced by the Independent Pneumatic Tool Co., 248 South Jefferson St., Chicago, Illinois. The design of the unit compares with the larger sizes of Thor compressors and uses a Le Roi 4-cycle, heavy-duty engine as a power unit. The engine has a 3⅜-inch bore by 4½-inch stroke and is used in conjunction with a 2-cylinder compressor of 4½-inch bore by 4½-inch stroke.

The compressor is very compact which makes it readily portable and easily handled. The unit is complete with full automatic air pressure control, carburetor slow down for idling when running unloaded, Zenith carburetor, Eisemann high tension magneto with impulse couplings and air cleaners. It has an A. S. M. E. riveted type air receiver and a water circulating pump. The compressor is furnished in both skid mounted and rubber tired wheel mounting types.



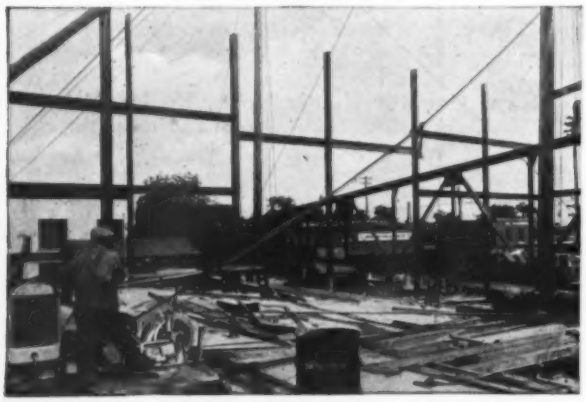
The New Thor 74-Cubic Foot Air Compressor

Single and Double Drum Hoists

THE accompanying illustration shows a 32-horsepower Jaeger Timken-thrust hoist made by the Jaeger Machine Co., 701 Dublin Ave., Columbus, Ohio, erecting steel trusses in connection with two gin poles, one drum leading to each pole, on a job of M. E. Gillioz of Monett, Mo. Featherweight controls and positive brakes on this hoist enable the operator to set the truss in exact position.

In addition to the ease of operation, this unit is rugged, simple and economical to operate. Friction is attained by the Jaeger positive thrust action, using Gadtke asbestos compound blocks. Friction return and release are attained by the same screw action of the thrust, so that thrust and release springs are entirely eliminated.

These hoists which are built in two models, single and double drum, and in sizes ranging from 10 to 50 horsepower, are especially adapted to pile driving, for dragline hauls in gravel pits, for material hoists, in connection with mast plant or towers and for steel erection.



A 32-Horsepower Jaeger Timken-Thrust Hoist in Use by M. E. Gillioz, Monett, Mo.

A New Six-Cylinder Heavy-Duty Truck

THE latest addition to the line of Mack 4 and 6-cylinder trucks, made by Mack Trucks, Inc., 252 West 64th St., New York City, is the Mack Model AK Six designed for heavy-duty service where greater speed and power are essential. This 6-cylinder job meets a specific need and does not supplant the present 4-cylinder Model AK. The new trucks retain the familiar Mack Bulldog type hood and are offered with either a covered or coupe type Mack cab.

The new unit is powered by a Mack 6-cylinder engine, with bore and stroke of 4½ by 5½ inches, and develops 126 horsepower at 2,200 rpm. The pistons are of aluminum, and of the invar strutted type. The connecting rods are tubular and the cylinders are cast in block.

Smooth running at practically all speeds is assured by the use of a case-hardened, drop-forged crankshaft which has integral counterweights and a vibration damper. The valves are flat seated, of the L head type, and are located at the right. Lubrication is of the force feed and splash type used so long on other Mack models, and all of the oil is filtered through a H. W. filtrator. Water is circulated by a centrifugal pump and the temperature is controlled automatically by a thermostat.

The transmission has four speeds forward and one reverse and is driven by a single plate dry type clutch. The final drive

The New Mack Model AK 6-Cylinder Truck

is of the Mack dual reduction type which has been thoroughly tested in other Mack models. This type of drive is full-floating and each gear assembly is readily and independently accessible without jacking up the axle or disturbing the wheels or brakes. A 45-degree tilt to the banjo type axle, an exclusive Mack feature, augments its strength and renders good road clearance compatible with the generous size of the gears.

Steering is of the screw and nut type. There is a special steering knuckle construction which greatly reduces steering effort and minimizes the effect of front wheel braking upon its steering. The front axle is of the reversed Elliot type with center point steering.

There are brakes of the expanding type on all four wheels. They are in two independent sets, the foot brakes being vacuum booster actuated, and the hand lever operating a secondary set on the driveshaft. This great braking power assures safety at maximum speed.

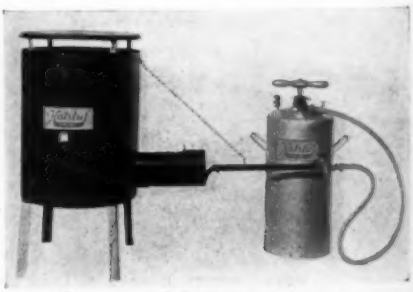
Long springs mounted in Mack rubber shock insulators and careful balancing of engine running parts, minimize vibration, thus insuring driving comfort, riding ease and maximum load protection. The standard wheelbase lengths of 174, 186, and 198 inches are available.

An Oil-Burning Smokeless Salamander

THE Hotstuf oil-burning salamander, made by the Mohawk Asphalt Heater Co., 68 Weaver St., Schenectady, N. Y., produces an intense heart, which is always under control, without the troublesome soot, smoke and gases given off by a coke-burning salamander.

The No. 50 Mohawk burner used with the Hotstuf salamander has the patented removable coil feature and the patented vaporizing tip. Being of horizontal type, it can be used for many other purposes on the job, such as a torch for thawing, melting ice or drying aggregate.

This salamander is made in one size with a heating chamber 19 inches in diameter by 24 inches high and an overall height with legs and cover of 40 inches. It can be furnished with a 5, 10, 15 or 20-gallon oil pressure tank. The approximate oil consumption is 1½ gallons per hour.



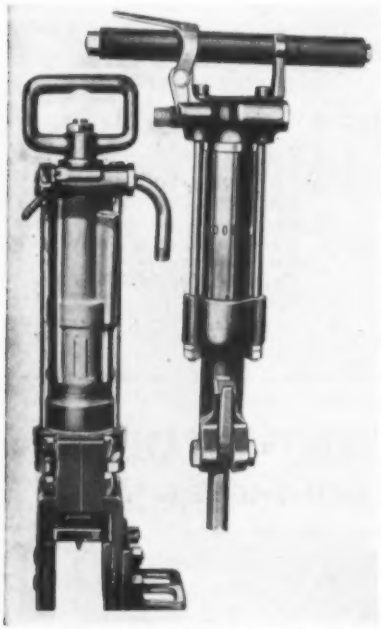
Hotstuf Oil-Burning Salamander

Two New Pneumatic Tools

A NEW and larger air-operated pile driver that will drive 3-inch sheet piling has been announced by the Ingersoll-Rand Co., 11 Broadway, New York. This tool, the R-30, weighs 148 pounds and can be readily carried by two men, and operated by one man after it has been placed in position. By adding removable cheek plates, it can be used to drive 2½ and 2-inch piling as well as 3-inch.

The R-30 has been designed for use on all excavation jobs where heavy sheet piling is required. It eliminates most of the splitting of piles, permitting the same pieces to be used several times. It is low in air consumption, a 7 x 6-inch portable compressor being sufficient to operate two tools. There are no exterior moving parts, making it safe in operation. It is equipped with a removable footpiece that allows the operator to add his weight to that of the tool when desired.

This company has also developed a new 38-pound paving breaker which is designed to meet the need for a demolition tool that is easy to handle. The new L-54 paving breaker is 14 pounds lighter than the next largest size and compares favorably with it in power. For general demolition work it can be easily handled in a horizontal or upward sloping position where heavier tools are difficult or unhandy to use. It is more convenient and safer to use on scaffolding than larger sizes. It is effective as a spike driver and will put down a large railroad spike in 4 seconds. This paving breaker uses a 1-inch hexagonal steel with a collared shank.

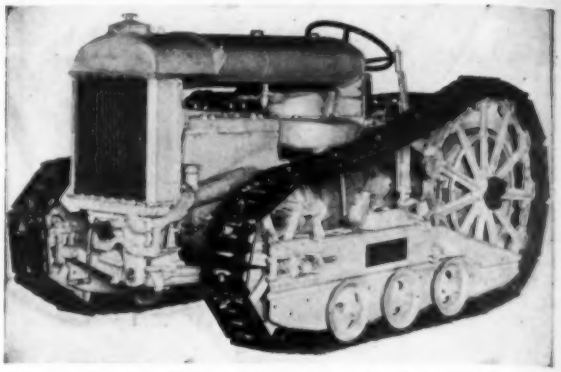


I-R New R-30 Pile Driver (Left) and the L-54 Paving Breaker

A New Crawler for the New Fordson

A NEW crawler unit which has many advantages over wheel tractors, such as sure footing and positive traction in all kinds of ground conditions, additional weight for bearing down on hard pulls, increased power, shorter turning radius and greater flexibility, has been developed by the Trackson Co., 1323 So. First St., Milwaukee, Wis., for the new Fordson tractor, converting it into a powerful, all-steel 2-ton crawler tractor.

Proper weight and balance and a track area of 1,100 square inches contact with the ground enables this new Model F Trackson crawler to hug the ground and develop tremendous pulling power. Most important of all is its ability to work equally well in soft, loose soil conditions, mud or sand, swamp land, or snow. Its light ground pressure, less per square inch than the pressure exerted by a man's foot, enables it to travel lightly over soft surfaces where wheel tractors or teams would mire and its ground gripping crawler tracks give it a firm foothold where the way is steep or otherwise bad going.



Model F Trackson Crawlers for the New Fordson

The crawlers may be quickly and easily installed by any mechanic, it being merely a matter of removing the wheels and attaching the crawlers with no special fitting, drilling or machine work required. No differential changes are necessary and there are no intricate parts to complicate the steering or operation of the tractor.

They are built entirely of steel and have few working parts to wear out or break down. The tracks are made of heavy electric alloy steel castings, heat-treated and hardened to provide extra strength and resistance to wear. Positive protection against sand and dust prolongs the life of all bearings and the patented truck wheel bearing are provided with a special oil reservoir and are of ring-oiling design, making lubrication certain and easy.

Direct-Mounted, Self-Priming Centrifugal Pumps

COMBINING light weight and easy portability with staunch, sturdy construction, the La Bour Co., Inc., Elkhart, Ind., has developed the La Bour Type WPD 4-inch direct-mounted self-priming centrifugal pump.

This new model is guaranteed for a 20-foot suction lift. It is a 4-inch pump with a capacity of 400 gallons per minute at a 25-foot head or 350 gallons per minute at a 35-foot head. The suction trap and separator are cast of aluminum which, while it costs more than other materials, permits light weight in conjunction with heavy wall and resultant long life. The pump casing is cast iron and the impeller is a special chrome-nickel alloy steel with great wear-resisting qualities. It is a

La Bour Self-Priming Centrifugal Pump

single unit with one impeller and is completely self-priming, without the use of valves, floats or auxiliary apparatus of any kind. There is no recirculation after prime has been established, so that high efficiency is obtained and there is no interruption of the priming action due to clogging of small by-pass openings.

The pump is powered with a direct-connected LeRoi 8-10 horsepower ball-bearing engine which is governor-controlled and is set at the factory for best operation. Weighing less than 1,000 pounds and carefully balanced on its two wheels, the complete outfit can be moved easily by one man. Adjustable legs on one end permit placing the pump in a solid position even when resting on uneven ground.

A New Power Scoop

THE new Clarktor shovel, a power scoop, designed to handle any loose, fluid material such as sand, gravel, bulk cement, clay, etc., is manufactured by the Clark Tructractor Co., Battle Creek, Michigan. It is reported that this shovel will do the work of 10 to 15 shovel and barrow men and do it in less time.

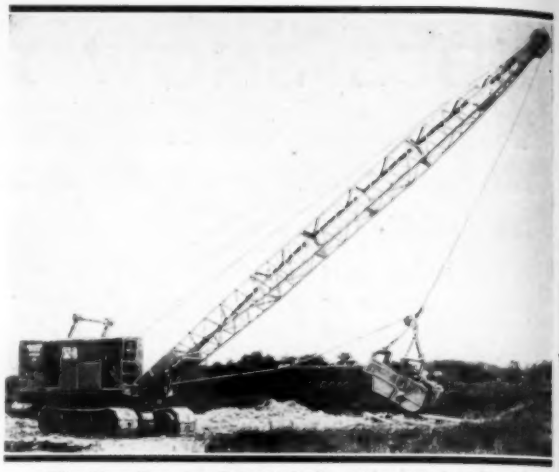
The standard bucket holds 9 cubic feet or 1,500 pounds, though larger cubic capacity buckets are furnished when the material to be handled is lighter than sand. Improved hydraulic cylinders enable the drivers to pick up and hold the load at any desired point, thus eliminating re-handling costs. The scoop approaches the pile, takes its load and carries it away easily and quickly, dumping it where it is wanted. Two models of different heights are available, one having an under-bucket clearance, with the bucket in dumped position of 3 feet 9 inches and the other of 6 feet 5 inches.

The New Clarktor Shovel

The chassis is a Clark Tructractor having a turning radius of only 108 inches. Standard truck transmission, multiple disc clutch and the Clark truck axle insure dependable service. The equipment includes a starter, generator, battery, and head and tail lights. The tractor type gas engine uses 5 or 6 gallons of gas and a pint of oil per day. Gas power insures 24 hour continuous operation with the equipment just as effective the last hour as the first.

Roadside Quarries in the Virginias

Road construction in Virginia and West Virginia is frequently through such rough territory that shipments of aggregate could only be made at a prohibitive cost. Hence, contractors frequently erect complete road crushing plants at convenient points on the job. Such a plant is described in "Ledge Converted into Quarry on Road Job," in the December issue.



The New Bucyrus-Erie 52-B Dragline with a 40-Foot Boom and 2-Yard Bucket

A New 2 ¼-Yard Diesel Shovel-Dragline

THE Bucyrus-Erie Co., South Milwaukee, Wis., has recently introduced the new 52-B diesel shovel, dragline, clamshell, crane, which they claim is "the fastest 2¼-yard diesel ever built." Dragline men will be interested in the new extra long and extra wide crawler type mounting provided, instead of the regular mounting, when low ground pressure bearing is required.

Complete steering control from the operator's position and independent propelling permitting swinging, hoisting, and propelling at the same time, are additional features. The power plant is an Atlas improved 4-cycle, 6-cylinder, solid-injection full diesel giving great fuel economy with the diesel's unique characteristic of increasing lugging power under a load. The new machine conforms to the latest standards of mechanical requirements having all high speed shafts mounted on ball or roller bearings, transmission and swing reversing gears and all gears below deck enclosed and running in oil, rugged unit steel-casting construction, and many other refinements in design. The machine is built for shipment on a flat car without removing the revolving frame and cab from the base.

A DODGE TRUCK IN USE IN JAPANESE HIGHWAY CONSTRUCTION

Present Day Road Construction in the Various Prefectures of Japan Is Done With Modern Equipment. The Highway Construction Department of the Prefectural Government of Techiti Uses This 1½-ton 150-inch Wheelbase Dodge Brothers Chassis Equipped with a Hydraulic Hoist and Dump Body

The Dayton Cog-Belt

A Corrugated V-Belt for Driving Construction Equipment

A NUMBER of manufacturers of construction equipment are now using Dayton Cog-Belts for driving pieces of equipment from the prime movers. The Cog-Belt derives its name from the series of tooth-shaped corrugations on the inner surface of the compression section. This cogged surface is not for the transmission of power, but provides flexibility and prevents buckling when the belt is flexed around the pulley, thereby causing it to hug rather than resist the pulley arc, and at the same time present even surfaces to the sides of the groove. Very important is the tough fibre and rubber composition used in the cogs in which the fibres are made to run cross-wise, creating great cross-sectional rigidity and preventing distortion. In other words, this position of the fibres creates a cross-wise reinforcement, overcoming any tendency of the belt to be "squashed" by the wedging action of the pulley groove. For the successful operation of any V-belt this rigidity of cross-section is essential.

Since the belt is die-cut, this patented position of the fibres causes their ends to engage the sides of the groove, giving a tough wearing surface of great gripping power.

The outer portion of the belt, being under tension when flexed around the pulley, is made so that it can elongate without undue internal strain. It consists of a series of layers of a bias cut fabric, providing just the right amount of "give." Since the belt is die-cut, not moulded, the ends of the threads in these layers are exposed to the sides of the pulley groove to form a part of the driving surface.

In the neutral zone lies the strength member, unaffected by conditions such as are found in the compression and tension zones. This section consists of a series of convolute layers of pre-stretched parallel cord cable fabric, built to the specifications of the manufacturer, the Dayton Rubber Manufacturing Co., Dayton, Ohio. In manufacturing the belt the cords are stretched with tremendous tension while being applied and permanently set in this position by vulcanization. This factor is mainly responsible for the non-stretching characteristics of these belts. The neutral section has the edges of the specially treated cord cables at the riding surface. Hence, the entire riding surface of the belt is a continuation of ends of threads in the fabric on the bias, edges of cord cables, and ends of fibres in the teeth, all of which have a certain portion of rubber. This creates a belt which in actual service shows a minimum of slippage, stretch and heating. These belts are applicable for any fractional drive required or drives up to 500 horsepower.

A New Small Weighing Batcher for Bridge and Culvert Work

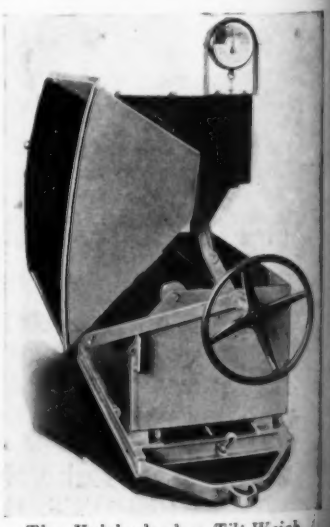
IN an increasing number of states, highway department specifications require the concrete aggregates, especially on bridge and culvert construction, to be measured by weight. A convenient device for quickly and accurately measuring predetermined amounts of concrete aggregates by weight has recently been developed by the Knickerbocker Co., Jackson, Mich.

This device is known as the Tilt-Weigh batcher. It operates entirely independent of the mixer and can be used to charge any type of mixer equipped with a power loading skip. It is placed in close proximity to the end of the mixer skip and may be charged in any convenient and practical manner. If stock piles are adjacent the materials may be shoveled in, but if they are not close enough for this method, materials may be wheeled and dumped into the batcher hopper from a low platform. Certain unusual layouts would permit spouting of materials, but ordinarily the wheeling method is most practical, especially in bridge construction.

Sand should be placed in the hopper first, so that when a batch of sand and stone is dumped into the loading skip the stone will be on the bottom. When aggregates are in the skip, cement is added in the usual way. A scale is constructed with two weigh arms, the sand arm having a capacity of 1,100 pounds and the stone arm a capacity of 2,100 pounds. After the poises on the beam have been set for the predetermined weight, the door of the beam case should be locked so that the poises cannot be changed. No attempts should be made to weigh with the dial, which is merely a tell-tale to show the approach to balance. The dial shows zero when the beam is in balance. Accuracy of the scale arm can be easily and quickly checked with test weights.

A small supply of aggregates should be placed adjacent to the batcher so that the man doing the weighing can, when necessary, add to or deduct from the material placed in the hopper by the barrow man. In most cases contractors using this batcher find that it does not add a man to the crew. The mixer operator, the man handling the cement or the last barrow man can trim the load.

When aggregates have been weighed the hopper tilts over, pivoted on two rollers. By means of the wheel, which actuates two sets of toggles, the hopper is quickly and easily tilted to deposit the batch cleanly in the skip. The Tilt-Weigh batcher is built in two sizes, 2-bag and 3-bag, with 1:2½:4 mix. The hopper of the 2-bag size will hold 13 cubic feet, and the 3-bag, 19½ cubic feet.



The Knickerbocker Tilt-Weigh Batcher